JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

Entered as second class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the act of Congress March 3, 1879.

VOL. XXXIII NO. 23 | SAN FRANCISCO, DECEMBER 5, 1914 | PER COPY, 25 CENTS

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INDUSTRIAL USES OF FUEL OIL.
BY F. B. DUNN.

GAS VS. ELECTRICITY FOR COOKING.
BY R. C. POWELL.

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Alphabetical Index to Advertisers, Page 8 Where to Buy It in the West, Page 9

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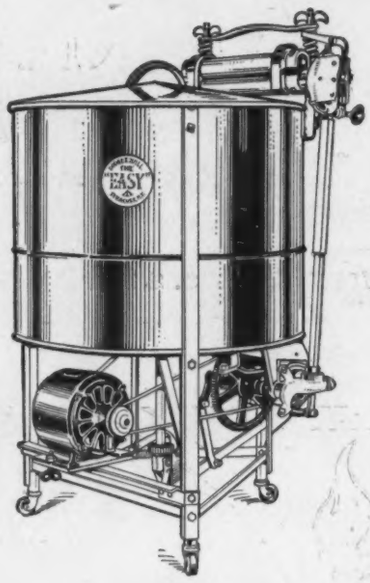

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POWER AND GAS
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VOLUME XXXIII SAN FRANCISCO, DECEMBER 5, 1914 NUMBER 23

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ARCH ILLUMINATION AT PORTLAND

BY C. C. CRAIG.

A few of the merchants on Third street in Portland, Oregon, realizing that their business was drifting further up town, recently called a meeting for the purpose of devising ways and means of retaining their trade. The Northwestern Electric Company was called upon to submit some unique method of street illumination, with the result as shown in the illustration.

Arch Illumination at Portland.

These archways are constructed of steel of four angle irons, boxed and latticed together, all the angles and lattice bars being riveted. The legs of the arches were made up into two sections each and completely manufactured in the shop and set up on the street by derricks. The arches extend to and rest upon a steel bed plate set in the concrete work in the sidewalk. The size of the steel legs are 12 by 18 in. The concrete casing which surrounds the bases of the arches and forms the columns, were cast in a mold of concrete set in place, smoothly finished, well rubbed and primed, and painted the same color as the steel work —being a light gray.

A special cable for lighting these arches was pulled from the central station and is controlled by a switch in the power house. The lights are distributed as follows:

Two 40 watt Mazda lamps contained in the globes on each column and one 750 watt nitrogen filled lamp in the central globe; the arches are outlined in 40 watt lamps, 48 outlets to the half arch or 192 outlining lamps to the arch.

The results obtained from the illumination were highly satisfactory to the merchants—the street being beautifully illuminated. On the day of the formal opening, the merchants secured double pages in the daily papers in which they all placed their advertisements and in the center a program announcing the hour of the illumination. That evening at various intersections along the street they had provided bands of music and although it was raining, the crowds that gathered long before the time for turning on the lights was so dense that the police had difficulty in handling them.

WHAT'S WRONG WITH MUNICIPAL OWNERSHIP?

BY CHAS. A. WARNER.

(This article presents a succinct analysis of the weak points in municipal ownership and some suggested remedies therefor. It is condensed from a paper presented at the Third Annual Conference of the League of Northwest Municipalities, Seattle, November 12, 1914.—The Editor.)

From the title of my paper it may be that some will anticipate an attack on the whole subject of municipal ownership. Yet that is not my purpose. I am not opposed to municipal ownership. In fact, I have a clear record in advocacy of clean, efficient, honest public ownership, as well as in constructive criticism of the other kind of public ownership.

One of the greatest deterrents to the right kind of municipal ownership is the way in which beneficiaries of the wrong kind of municipal ownership endeavor to confuse the public mind by condemning every one who honestly criticizes their methods.

During approximately 30 years in which what are now called public utilities have developed out of the imaginations of a few men, who were at first classed as dreamers, the world has seen a great many changes in the public point of view toward these utitities.

At first, no one paid any attention to the efforts of those who were trying to introduce new methods of light, heat, power, transportation and communication. These men were called "promoters" and as a rule, experienced considerable difficulty in getting either the public or the financial men to take their proposal seriously.

As the enterprises promoted by these pioneers of public utility evolution developed into established business institutions they were regarded just as any other line of business would be, as classes of private business destined to succeed or fail according to whether they were able to successfully meet natural competition. In the early days, any one who would have referred to an electric light business as a proper matter for municipal ownership and operation would have been derided.

The changes of public opinion or sentiment are hard to understand. One would naturally suppose that the public would be most concerned with those things which are necessary to human existence and that the degree of public concern would be proportionate to the extent to which things relate to preservation of life and health. Air, water, food, clothing, shelter, sanitation, police protection and fire protection are about in the proper order of importance in this respect. No one will seriously contend for a minute that electric light is a necessity and yet this is the one kind of business into which more municipalities have entered than any other aside from water, sewage, police and fire protection which are necessities. Why was such a luxury as electric light chosen as a field for municipal operation and not the grocery business which deals in necessities? I have asked this question of many men and have received many answers. The common answer is that the electric light business depends on the use of the streets and is therefore a natural monopoly and should be owned and operated by the city. Well, suppose we agree that the electric light business is a natural monopoly. Is it any more a natural monopoly than sugar or oil for example? From the same point of view all lines of commerce and industry are natural monopolies and if we apply the same procedure in each case we shall have applied socialism with all its blessings.

It is also stated that public utility profits have been enormous and that it is necessary that these utilities be taken over and operated by the public in order to prevent a few holders of public utility securities from amassing profits so enormous that those security holders will become unduly powerful and constitute a menace to individual freedom.

It may be that some of the companies during the period of transition from the experimental to the successful operating stage of public utilities, made large profits. If so, I hardly think fair men will begrudge them even extraordinary profits, considering the risks taken and the ability and energy necessary to development of successful institutions out of a bare set of conditions. Certainly many companies did not make even a fair rate of income, and I doubt, if on the average, income has been in proportion to the other elements involved. On the other hand look at the enormous fortunes that have been amassed in merchandising, and in financial, mineral and industrial pursuits. Some of these, as before stated, have a much closer relation to public welfare than the so-called utilities and they have certainly shown greater profits with less risk attached to the money invested. Many such institutions have been built up on a small investment, entirely out of the profits of the business. No public utility could do this. All men of practical experience in operating public utilities, know that the greater the business, the more bonds must be issued to pay for extensions to handle the business, so that an important factor in successful management of public utilities has been and is the borrowing of money. I remember talking with an official of a large telephone company a few years ago. The city in which he operated was growing fast. I asked him how his company was prospering. He replied: "We have only one difficulty. We are suffering from too much prosperity. We are putting all our profits into extensions and we can't borrow money fast enough to take care of new business."

There is no fundamental reason why the public have gone into the electric light business instead of the grocery business. I have studied the matter from several angles, as private citizen, and as public official, and I find the answer in the way the public were treated by the companies which have developed or merged into these modern public utility corporations. I remember some of those early managers. One whom I worked under in my early apprentice days on line work, was in Seattle for a while. I don't know how he got along in Seattle, but to serve under him on the line was to obtain an advanced course in the art of profanity that would be of great value in driving dogs in Alaska or mules in Missouri.

The ability which accomplishes one kind of result does not always succeed along another line. In Rockingham, N. C., where I was engaged in a hydroelectric development, the main work on the big dam was done by a southern contractor who received a percentage on the cost. A manager from New England was sent

to see that the company's interests were protected. This New England man knew a great deal about some things but the things he did not know about negro labor would fill volumes. He watched the negroes lolling along leisurely and singing contentedly at their work, and his impatience grew daily. Finally he could contain himself no longer. He walked up to the contractor and said: "If I were handling that gang I could get twice as much work out of them in a day as they are doing now." "Yes," said the contractor, "you could; and the next day you wouldn't have a nigger on the job."

It takes one kind of ability to handle construction work. It takes an entirely different kind to handle the public. Sometimes the two are combined in one man, but many of the earlier officials had to learn their lesson and many of them gave way to the modern public utility official, who realizes a sort of partnership—a community of interest—between himself, his company and the city in which he operates. The modern official of these companies spends a great deal of time in meeting the public, individually and collectively and endeavoring to satisfy complaints. The old time manager would often refuse to see patrons of his company, or having talked with them, leave them with a feeling of resentment.

Reforms come through sentiment, rather than through thought, and it is probable that most of the troubles of public utility companies arose from the accumulated resentment of many men who felt "sore" against the companies.

Public utility companies, as a rule, have gone through the process of development to the point of a public policy of management. Their officials are now courteous and attentive to the public. They are striving to please and they are spurred to additional effort by the very evident fact that their highest endeavor is necessary in order to attain even a moderate degree of public consideration. Also, the corporations are now regulated by public officials well trained in matters of valuation and operation, thus giving each corporation an added incentive to proper regard for the public welfare and comfort.

One trouble with municipal operation is that municipal utilities are not placed upon the same basis as privately operated utilities. The city of Los Angles with its own water plant charges the bills against the premises and yet it will not allow the water companies supplying a portion of the city to do the same thing.

In some cases public utility corporations are regulated very severely and at the same time competing municipal utilities are run without regulation. A corporation in borrowing money for extensions can use only the property of the utility itself as a basis for a loan. A city borrows on bonds issued against the whole city and secured by the entire taxing power of the city against all private property in the city, including that of the public utility corporaton with whom the city may be in competition.

Public utility organizations, whether privately or publicly owned, are dependent for their operation, upon human beings and generally speaking, it is the human element that determines the degree of their success or failure. A boy who has all his bills paid by a wealthy father does not usually try very hard to earn his own living. A utility that can exercise special privileges in collecting its income and that can tax even its competitor's property to provide money for its requirements, lacks to some extent, a healthy stimulus to hard work and close economy. In some cases it may be necessary that a municipal utility should have these special privileges on the same ground that a high tariff has been deemed necessary to develop the infant industries of the U. S. There are instances, however, where the special privileges exercised by municipal utilities have been the direct cause of mismanagement, graft, extravagance or exploitation of the utility for private benefit.

Another difficulty that stands in the way of proper municipal operation of utilities has been the popularity of the municipal ownership idea. In theory, any line of business could be operated by the government at cost and the goods sold to the consumer at a lower price than if a profit were charged. This sounds all right. Also the public mind instinctively approves of the idea that each individual has a personal ownership in the municipal utility. Therefore, because of the popularity which in a way was an advantage, the municipal utility has been tempted to take advantage of the popularity and in some instances has obtained poorer results for the average citizen than if the utility had been obliged to earn the consideration of the public.

I have heard municipal extravagance excused on the ground that it made jobs for more American workmen. I have found that this is contrary to the facts. I sympathize with the man who has to work with his hands. In one of our Northwestern cities it was recently proposed to increase the budget for salaries. There are an unusual number of men out of work in all cities, at this time. Did the increase provide employment for idle men? Not at all. It provided increases in salaries for a few who now hold offices, and that at a time when corporations are passing dividends and when a corporation official or employee would risk his job if he asked for a raise in salary.

But the public—how about the public? What about the benefit of municipal ownership to the public? Can't a man get better service from his own utility run without profit than from that of another man run to make money for its owner? My answer is that in theory there is no justification for private enterprise. In fact the actual progress of the world in those things which make for greater physical comfort, has been almost altogether accomplished by men who worked for a personal reward. The man who has special knowledge or is in a position of special influence will use that knowledge or influence for the benefit of himself and those to whom he is bound by ties of personal loyalty or association. This is just as true of those in the municipal service as of other human beings. It don't make men more righteous to put them in political office.

I believe in municipal ownership. No man has been more enthusiastic about it than I have. Few men have fought harder or sacrificed more for honest municipal management than I have. I wish the ideal might be achieved in this as in many other fields of human endeavor, but observation of municipal opera-

tion has forced me to the conclusion that the ideal is a long way off and that if municipal operation of public utilities is ever to serve the best interests of the public, it must be conducted upon a basis that will eliminate many of the evils under which it now labors.

Public utility corporations as now regulated by trained experts, managed by men of broad views and are generally giving as good service at as low cost as can be obtained from municipal operation. There have been many criticisms of regulation. I believe many such criticisms are unjustified, but if they were all true, how are you going to get men to be honest under all the temptations of municipal operation if you can't get men to be honest in an office where the whole motive of the office is one of publicity?

Go to the office of the average corporation or the Railroad Commission of your own state and you will ordinarily get courteous treatment and any information to which you are entitled as a citizen or a patron of public service. I have known citizens of Los Angeles to go to the office of the Los Angeles Aqueduct and be met with the question: "Who do you represent?" The mere fact of citizenship gave them no title to the information. How much actual ownership do citizens possess under such circumstances?

In one large northwestern city where there is regulation by a state board, a franchise has been granted to a competing company. In two others, municipal plants are competing with private companies on uneven terms. In the former case, the new company starts with a modern plant and is able to make lower rates than it will when 20 years of necessary changes add to its interest burden. In the latter cases the municipalities give the advantage to the plants that are a part of their political system.

Now, I shall not attempt to argue for fairness to corporations. To many advocates of municipal ownership that does not appeal. Some who will say "give the devil his due," place public utility corporations in a class to whom even that ultra-charitable attitude does not apply. What must appeal to all, however, is the point of view of the public good. How can that best be served? Think a minute. Would you place your brains and money at the service of a community or a neighborhood where you were limited to a maximum earning of 8 per cent on your investment and at the same time given no protection against positive destruction of your property? The continued progress of our Northwest depends on brains and capital. Physical value—that much boasted basis of rate regulation—does not exist. Physical value has no value until coupled with the intangible value of men's brains. It is the water running away to the sea, the iron ore in the ground, the tree standing uncut in the forest. What is called physical value even by the narrowest construction, is raw material plus brains—physical substance plus the intangible element that gives it value for men's use.

To create out of our raw resources things of value to mankind, we must welcome brains and money. Both are necessary. There is some money that will go into speculation, playing for a high stake against great risks. There is other money that demands a guarantee and will accept a lower rate of return. Public utility investment, under regulation, precludes speculative investment. Do we wish also to eliminate the conservative money? Is it not a clear public fact that if we limit public utility investment to the same rate that can be obtained on mortgages without risk, we must protect that public utility money against loss or have it withdrawn from use as fast as possible?

It is absolutely true that having the old public utility that has gone through the change of 30 years; and having placed it on a basis of limited return; and then having subjected it to ruinous competition—we are saying as plainly as words could say it: "We don't want private capital, here. Any one who invests his money here must expect to have it taken away from him in any way that suits us."

It has been said that all reforms come from the plain people. In the case of municipal ownership this holds true. Those who are feeling the ill effect of bad municipal management are the workmen. The complaints are coming from them. In Los Angeles the investigation of the aqueduct was forced by socialists who are ultra radical on the subject of municipal ownership.

If muncipal operation of public utilities is to become a general success it must be by an awakened citizenship who fully realize the evils in existence and demand that municipal operation shall face the same tests of efficiency, honesty and public service as private corporations have to meet. I fear that will be a matter of a good many years and it may be that the public will become disgusted before the necessary house-cleaning shall be accomplished.

For the present, I am convinced that the public good will be best served; the greatest development of our resources achieved; and the "greatest good to the greatest number" realized by public ownership of public resources and private development of those resources under public regulation on terms that will protect the public and encourage private enterprise. In this way the government serves its function of protection and to private enterprise is left those things which always have and always will develop to the highest degree through private enterprise.

What we as students of public affairs are most concerned with is not the carrying out of some theory to which we may be committed, but the solution of the problem of how the greatest total good may be accomplished. What the Northwest needs is development limited only by a proper regard for the conservation of public property and the welfare of the citizen.

There is big constructive work to be accomplished. It offers a field for the maximum endeavor of every public man in the Northwest. I wish that opportunity existed for me to tell you of some of the plans I have for making the Northwest a better country for the whole of us. It is about time that public officials and their opponents stopped calling names and got down to a basis of co-operation. There is room enough in the Northwest for all of us and a great many millions more. What is needed is a combination of government ownership and private enterprise such as already exists in other countries and the West will develop into the greatest country ever known—great in all that the highest type of men may desire as a country in which to live and work.

INDUSTRIAL USES OF FUEL OIL

BY F. B. DUNN.

(Continued.)

Oil Burners.

The history of oil burners dates from the early part of the last century. Records of improvements have been kept by various writers and the patent office. Such writers on oil fuel as Brannt, Booth, North, Hodgetts, Lewes, Percy, Henry and Goulichambaroff, have described in detail the successes and results obtained by the inventors.

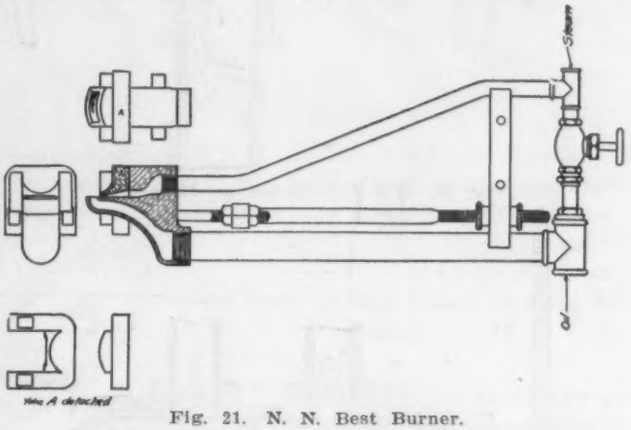


Fig. 21. N. N. Best Burner.

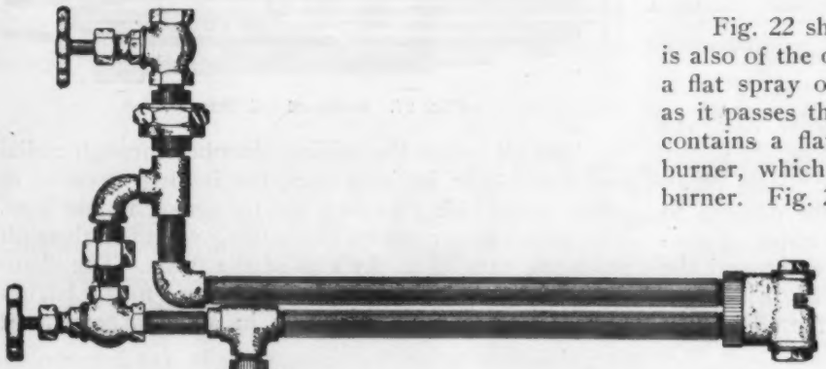


Fig. 22. Witt Gravity Oil Burner.

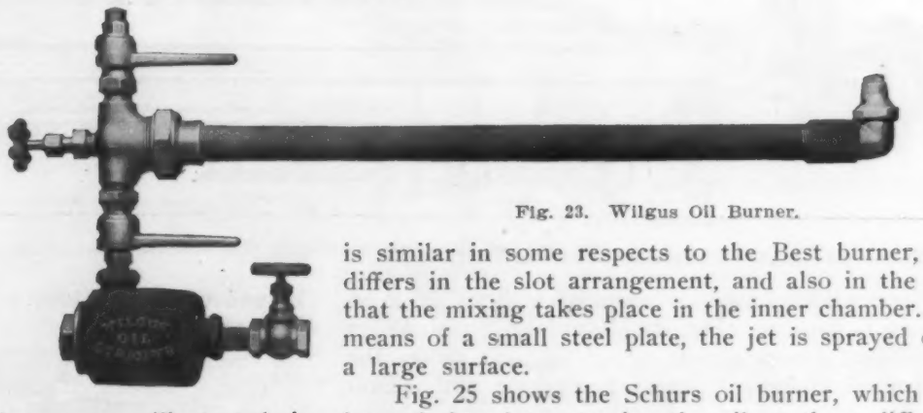


Fig. 23. Wilgus Oil Burner.

Various types of oil burners are illustrated, in order that the reader may have an idea of the methods adopted by the inventors to atomize the oil. These burners are in successful operation in plants visited by the author in various parts of the world.

Fig. 21 shows the W. N. Best oil burner. This is termed an outside mixer because of the fact that the mixing takes place at the outer tip of the burner. A siphoning action draws the oil from the lower tube, and it is atomized by the steam with which it comes in contact at the top of the tube. This burner has been known to burn tar as well as oil.

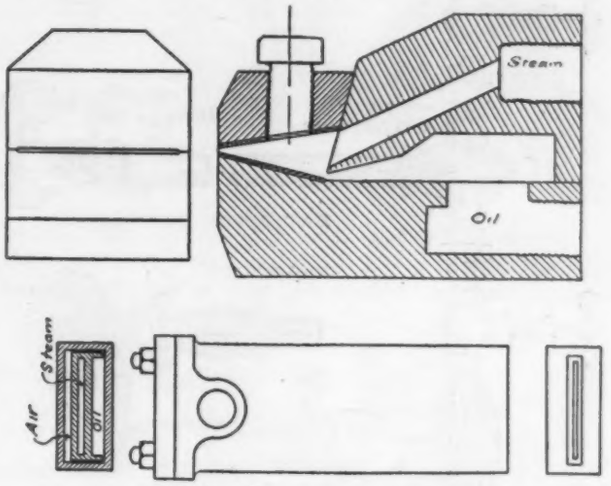


Fig. 24. Hammell Oil Burner.

Fig. 22 shows the Witt gravity oil burner which is also of the outside mixing type. The oil flows over a flat spray of steam coming from the bottom tube as it passes through the upper tube to the tip, which contains a flat slot. Fig. 23. shows the Wilgus oil burner, which operates much the same as the Witt burner. Fig. 24 shows the Hammel oil burner which is similar in some respects to the Best burner, but differs in the slot arrangement, and also in the fact that the mixing takes place in the inner chamber. By means of a small steel plate, the jet is sprayed over a large surface.

Fig. 25 shows the Schurs oil burner, which has been designed to atomize the oil at three different points. The first atomizing point breaks up the oil. The tube superheats the spray, and the second atomizing point breaks it up into a finer and more perfect mixture. At the third atomizing point or tip the spray forms into a flat stream; this third point acts as a carburetor, changing the spray to a vapor.

Fig. 26 shows the Grundell-Tucker oil burner. The burner consists of a fitting having an internal dividing wall. An air pipe forming the shell of the burner is screwed into the mixing head; this head has a number of spiral grooves which give to the mixture a whirling motion. The burner is operated with compressed air.

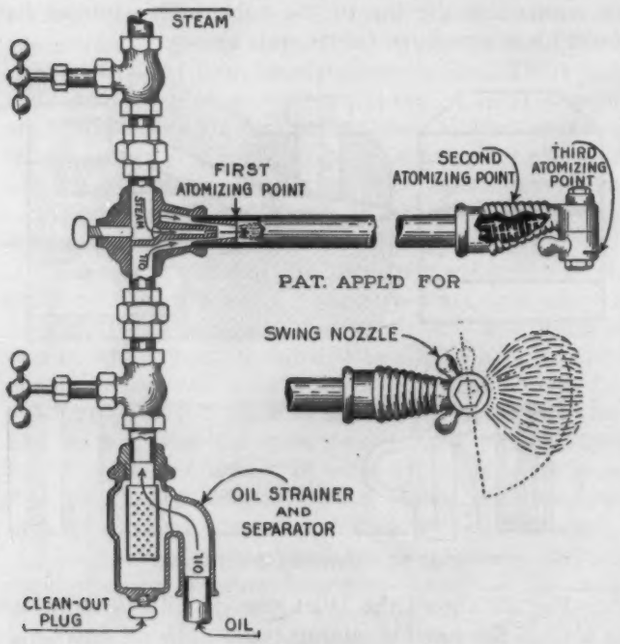


Fig. 25. Schur's Oil Burner.

one another, so that the stream is broken up. The oil tube contains a regulating spindle with a pointed end fitting the conical end of the tube, which itself serves as a valve to regulate the supply of oil.

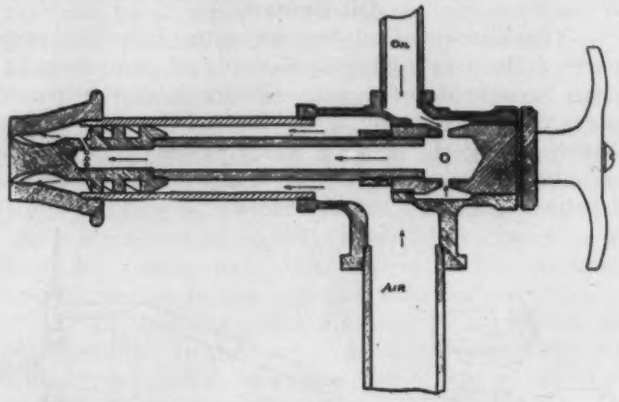


Fig. 26. Grundell-Tucker Oil Burner.

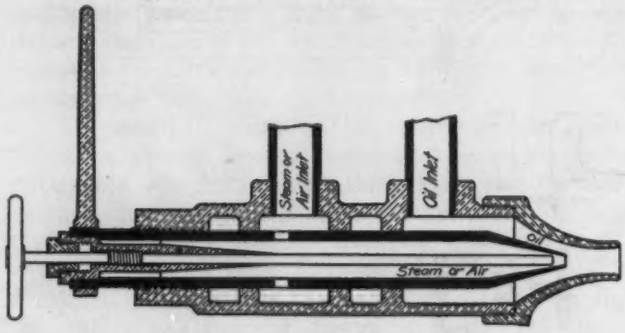


Fig. 27. Heresoff Oil Burner.

Fig. 27 shows the Hereshoff oil burner, designed to operate with either steam or air. Fig. 28 shows the Lassoe-Lovekin oil burner. This consists of an air tube, and a centrally located oil tube passing to the tip. The latter is provided with a series of converging, helically arranged jet appertures around the oil nozzle. Passing through the oil tube is a regulating rod tapered at the end to spray the oil in conical form. This burner is operated with an air pressure of 14 ounces. Fig. 29 shows the Fitzsimmons oil burner, a very simple type. Fig. 30 shows the Holden oil burner, designed to operate with steam and air.

The oil enters the mixing chamber through radial perforations, or inclined ones, the issuing streams, in either case, being broken up by opposing surfaces. The steam or air enters the mixing chamber through passages, parallel to the axis of the tubes. The channels through which the mixture escapes to the burner head may be formed as slots in an enlargement at the end of the oil tube. These chambers are especially arranged.

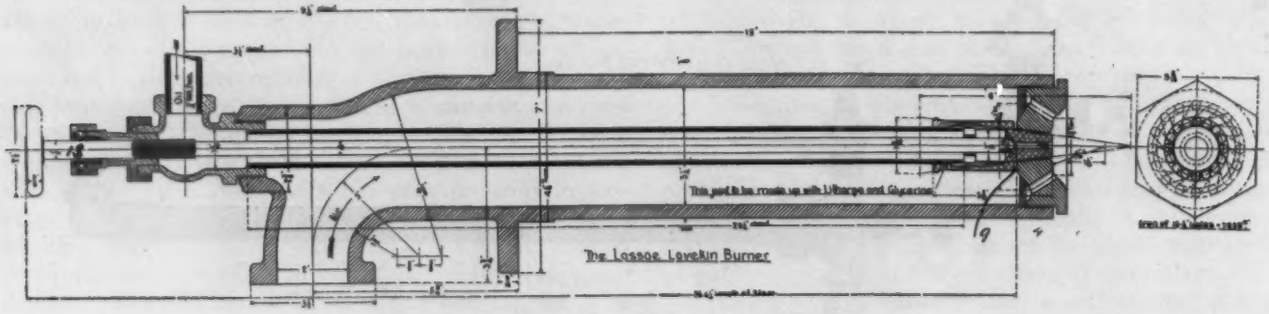


Fig. 28. Lassoe-Lovekin Oil Burner.

Fig. 31 shows the Staples & Pfieffer oil burner. Oil, and steam or air, are passed through an inner and an outer tube, and through specially arranged perforations to a mixing chamber, whence the mixture passes through other perforations and channels to a head, containing baffling plates, finally escaping through the openings. The various openings are not in line with

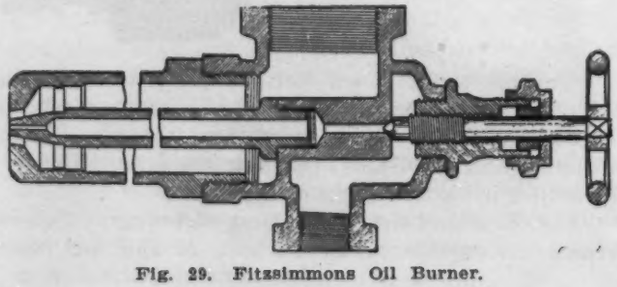


Fig. 29. Fitzsimmons Oil Burner.

Fig. 32 shows a number of low pressure oil burners made by T. P. Jarvis. Fig. 33 shows the McDonald flue oil burner. This oil burner was tried out by the U. S. Naval Board. Fig. 34 shows a mechanical burner used in the Baku oil fields of Russia. The spraying is effected by two sets of spiral guide blades, one set within an inner tip and one within the outer tip. The outer spraying tip is removable, so that as the edges wear, new tips can be inserted, or special tips can be placed for use under certain pressures or temperatures of the oil. Fig. 35 shows the naval fuel oil burner, devised to operate by mechanical action. Modern types of mechanical oil burners showing the furnace arrangements will be treated later.

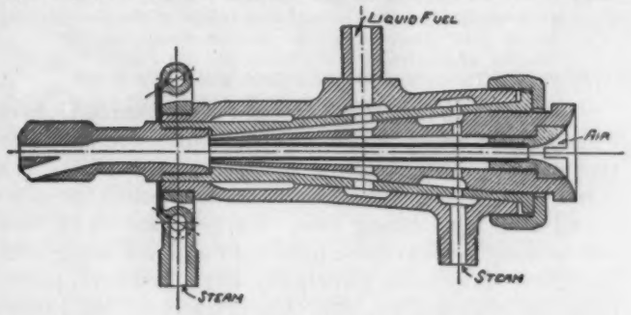


Fig. 30. Holden Oil Burner.

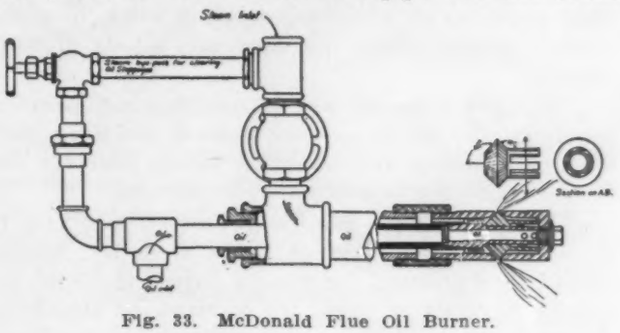


Fig. 33. McDonald Flue Oil Burner.

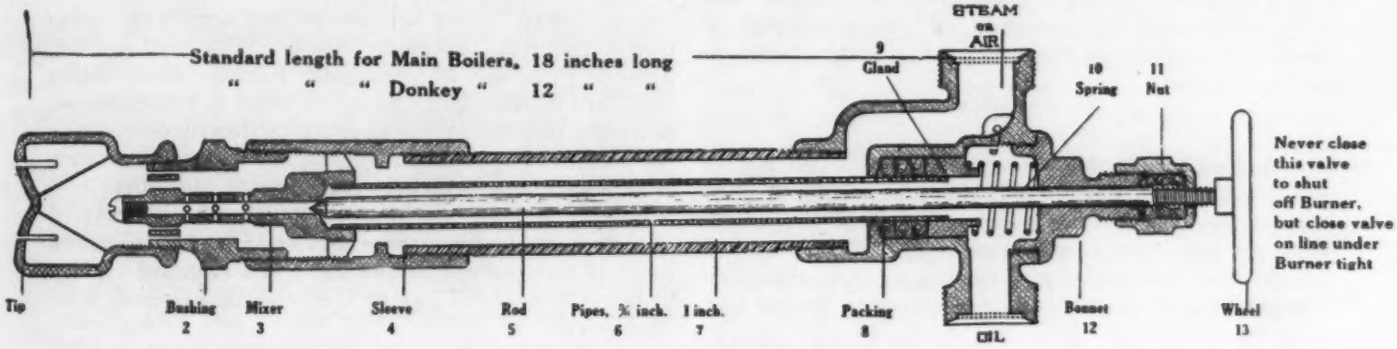


Fig. 31. Staples & Pfieffer Oil Burner.

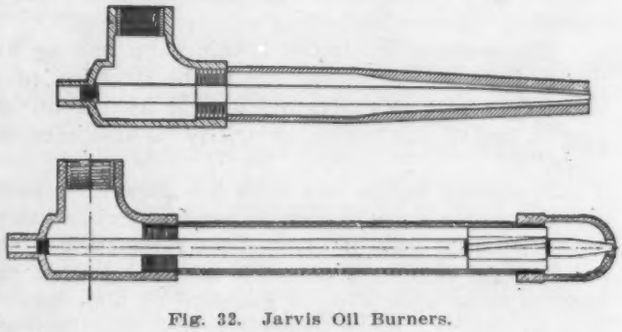


Fig. 32. Jarvis Oil Burners.

A close inspection of the various types of oil burners illustrated, will show clearly that it is necessary to heat the oil in order to properly atomize it. Experiments have proven that fuel oil will not burn in a solid mass, but that it must be broken into minute particles by heat and mechanical action, and then immediately exposed to air.

Heating the oil lowers its viscosity, with the result that any suspended water more readily separates out.

A temperature of about 125 degrees has been found to produce the best results. When oil is heated above the flash point, trouble occurs. The carbon will precipitate and settle in the pipe lines and at the burner tip. There is also a danger of explosion, if there are any leaks in the oil line. When the oil is heated before reaching the burner, less air or steam will be required to atomize it. This is an important point, for it has been proven in practice that burners require at least 3 per cent for perfect atomization, and many burners are in practice using from 5 to 10 per cent.

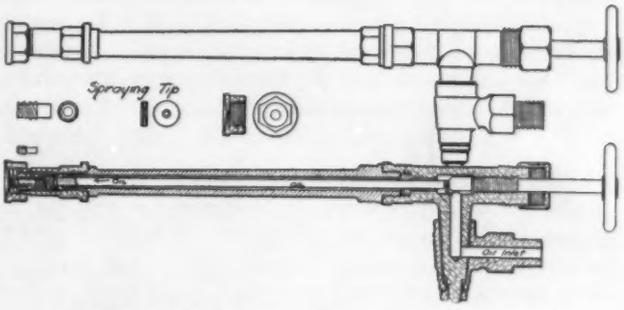


Fig. 34. Mechanical Burner Used in Baku Oil Fields.

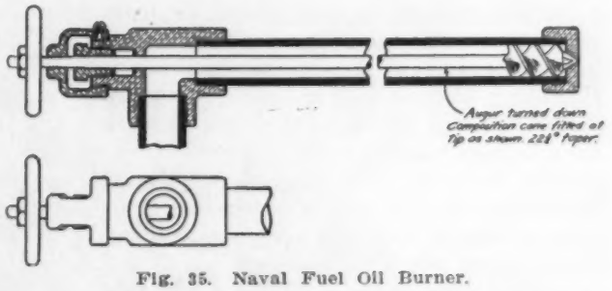


Fig. 35. Naval Fuel Oil Burner.

Air pressures as low as 10 ounces are at present being used with excellent results under especially constructed furnaces.

Compressed air has been found more economical than steam as an atomizing agent in brick, lime and cement plants, where the units are a long distance apart.

In many cases the cost of installing and operating an electrically driven air compressor is much less than that of installing and operating steam boilers. The losses due to condensation are also avoided.

Many plants are fitted with burners that have to be forced to get sufficient steam from the boilers. This is bad practice, for when a burner is forced, excessive amounts of steam are required for atomizing. Incomplete combustion and high stack temperatures, with their attendant losses, are bound to occur, and by forcing the burner and centralizing the heat, tubes and sheets may be blistered.

For all these reasons, the greatest economy can only be secured by installing an ample number of burners to supply all the fuel needed by the furnaces without forcing.

(To be continued.)

Automobile headlights are to be abolished within the city limits of Baltimore. It is claimed by the advocates of such a restrictive measure that the fierce, blinding headlight is not needed along the lines of usually well-illuminated city streets, while on the other hand the use of the lights is productive of danger and discomfort.

Meter deposits and other charges made by public service corporations before service connection will be made are being investigated by the California Railroad Commission. The argument in favor of such charges regards them as a tender of good faith. To require public service corporations to give services to persons they do not know will be virtually a deprivation of property without due process of law.

A wireless telephone for train service has been perfected by Dr. Frederick Millener for use on the Union Pacific Lines out of Omaha. It may be used as an intercommunicating telephone from car to car, a long distance wire telephone when the train is stopped at a station, and when the train is in motion beween stations, a wireless telephone by means of which it is possible to talk to the train ahead, the train behind, or the station. The device is so arranged that while talking from car to car it is selective talking and selective signalling. While talking long distance by wire, only one person can talk from the train at a time, and the train is connected to the city trunks. On leaving the station, from any car you can call the baggage car, requesting them to start the wireless generator. As soon as that is done, the party can commence to talk. The distance which the message travels is the distance from the aerials on the train to the wire telegraph lines alongside the track. A pair of these wires have been balanced up and equipped with condensers around the telegraph instruments, and are used as an antenna.

GAS VS. ELECTRICITY FOR COOKING.

BY R. C. POWELL.

(This paper is believed to be as fair and impartial statement of the relative merits of gas and electricity for cooking as has yet been prepared. It was presented at the 22nd annual convention of the Pacific Coast Gas Association, the author being superintendent of electrical distribution for the Pacific Gas & Electric Company at Oakland, Cal.—The Editor.)

During the last three or four years there has been considerable effort put forth by manufacturers of electric devices, and to some extent by electric central stations, towards an extensive introduction of electricity into the heating field. Large numbers of various heating devices have been sold and are being sold. But these have been principally irons, toasters, percolators, soldering-irons, etc. Comparatively few ranges have been sold, although a few fireless cookers and bake ovens have been introduced.

Recently, manufacturers of electric ranges have become active and are putting out a very excellent appliance. Some of these have been installed in a number of United States battleships and according to reports are giving excellent results. For this service, however, the use is principally baking, since boiled foods are cooked with steam. It must be remembered, however, that the saving in space of electric ovens over the coal-fired type is an item of no mean importance aboard ship, and electricity is generated very cheaply—one cent, or less, per kilowatt-hour. The success of electric cooking for marine service is of no assistance to us in our present discussion and I mention it only to bring before you one of the latest achievements of electricity.

In England, electric cooking and heating has made considerable progress and there seems to have been more agitation and discussion among the central station men there than here. This may appear strange in view of the fact that England is a country in which there is a high gas consumption, and where the electric central station industry has not been developed to a point comparable with our own. Electric appliances have to some extent been put out by English central stations on a rental basis. In Germany, also, there is increasing interest regarding electric heating.

The question of electric cooking and heating has always been an interesting one to the electrical man, because to him it represents a field as yet unconquered, and to this extent, electricity "is still in its infancy."

In coming before you with this paper, I assume that the growing use of electric heating devices has at least stirred up some interest in the gas man, if it has not brought him to a point of wondering what the effect is to be upon the gas business. I hope what I have to say will be of interest to you and shall attempt to attack the question from the impartial viewpoint of one connected with a company manufacturing and distributing very extensively both these would-be competitors.

If electricity is to compete with gas on a large scale it will, of course, be necessary to deliver electric power to the consumer at such a price that the net result as regards service and cost will be approximately that of gas. This net result will depend upon (1) the efficiency of the consumer's appliance, (2) the

cost per cubic foot for gas, or per kilowatt-hour for electricity as delivered at the meter. The claims of the manufacturers of electric ranges are greater cleanliness and freedom from disagreeable products of combustion, high efficiency, and decreased loss of weight in cooking.

I have not been able to find very much reliable data regarding the efficiency of either gas or electric cooking and heating—most of the figures given being apparently estimates or mere guesses.

In a paper before the Institution of Electrical Engineers (England) in 1911, Mr. Harold Gray reports some experiments he made with gas and electric cooking. He evaporated one pound of water at various rates of cubic feet per hour and from his figures I find an efficiency of 32.5 per cent at 3 cubic feet per hour to 38.8 per cent at 10 cubic feet per hour with gas of 600 B.t.u. Evaporating water with electricity he obtained 91 per cent with a "self-contained one pint saucepan," using a hot plate with aluminum utensil 65.2 per cent, and with an earthen ware pot 62.4 per cent. The mean of his results for electric cooking gives an efficiency of 75 per cent. With a gas oven of 6400 cubic inches, 8 pounds of bread were baked in 58 minutes with 31 cubic feet of gas, and 9 pounds of bread were baked in an electric oven of 6137 cubic inches in 52 minutes, consuming 0.92 kilowatt-hour. With gas at 90 cents per thousand and electricity at 4 cents per kilowatt-hour, the cost per pound of bread with these ovens would be approximately equal. It may be interesting to note that in England the rates used in discussions of this character are about 60 cents for gas and 2 cents for electricity.

In 1913, Mr. T. P. Wilmshurst, in a paper on "The Commercial Aspect of Electric Cooking and Heating," deals with the loss of weight in cooking and with the heating of water. With various kinds of meats he found the average loss of weight to be: Coal range, 34 per cent; gas, 23 per cent, and electric, 11 per cent.

His data on water heating appear to have been estimated and he allows the following: Coal, 10 per cent; gas, 50 per cent, and electric, 90 per cent. He also mentions a test on a "Belling electric geyser," which gave over 97 per cent efficiency.

Most writers on the subject usually give for coal and coke an efficiency of 2 to 10 per cent, gas 12 to 15 per cent, and electric 80 to 90 per cent. These men are usually electrical and I am afraid in their enthusiasm they have overestimated the efficiency of their own appliances and underestimated those of gas. With some tests of my own, I found the following: Electric hot plates (three types) to vary from 22 per cent to 45 per cent efficiency; gas (assumed at 600 B.t.u.) 35 per cent efficiency when heating water in an aluminum tea kettle holding about 1½ gallons, and water heated on an electric range of very improved type, 62 per cent. From Mr. Gray's and my own experiments, I believe the all-around efficiency of gas is at least 25 per cent and electric is not over 75 per cent.

When converted into heat, 1 kilowatt-hour gives 3412 B.t.u., and if we assume electricity to be used at 75 per cent efficiency, 60 kilowatt-hours will give the same useful heating as 1000 cubic feet of gas of 600 B.t.u. at 25.6 per cent efficiency—very easy figures to remember, 60 kilowatt-hours equals 1000 cubic feet gas of 600 B.t.u. as ordinarily used for heating and cooking. Hence, on a basis of cost for useful fuel we have:

Gas at	equals	electricity at
$0.75 per M.		1.25 cents per kw.h.
0.90 " "		1.50 " " "
1.00 " "		1.67 " " "
1.25 " "		2.08 " " "
1.50 " "		2.50 " " "
1.75 " "		2.92 " " "
2.00 " "		3.33 " " "
2.25 " "		3.75 " " "
2.50 " "		4.17 " " "

Now gas, in some places, is being sold for 75 cents per thousand, but there is not much electricity being distributed for ordinary cooking purposes at 1¼ cents per kilowatt-hour, or anything near this price. Electricity for heating purposes is, however, sold at 3 and 4 cents, and in communities where gas could not be sold profitably at $1.75 per thousand. Hence, in the smaller towns and country districts the electric cooking and heating business should develop to considerable proportions, particularly where hydroelectric power is cheap and fuel high.

For certain irrigation projects electric plants have been built and the power transmitted for pumping. In winter since there is no pumping, the plants are practically idle, and during this season, electric current can be produced so cheaply as to be able to compete with almost any other fuel. A number of such plants have thus quite a heating and cooking load, but these cases, like the application of electricity for heating in marine service, while sure to greatly increase, are under somewhat special conditions and are not much of a factor as a competitor of gas.

In the large cities where gas is distributed. electricity is sold for from 6 to 10 cents or more in the residence districts, where the larger portion of the gas is consumed. Here in California the prevailing rate is 7 cents, and the rate for cooking and heating about 3 or 4 cents, sliding perhaps to 1.5 cents after about $10 or $12 worth for the ordinary range has been consumed at the higher rate—which means the rate is practically 3 or 4 cents. These are pretty low rates for electricity; in fact, electricity in many parts of California is extremely cheap and many of the electric men doubtless feel in some cases, have more than reached bottom.

Some of the electrical men are very enthusiastic over the possibilities of electric cooking—the man with ranges to sell seeing a market for millions of his appliances and the central station man beholding an enormous demand for his product. In order to devolop this business against gas competition it is, of course, necessary to offer a very low rate for electricity. The central station is tempted to do this since there seems to be among many electrical men a belief that the taking on of a large cooking load will so improve the load factor as to ultimately return a good profit, and make up the loss he must sustain in developing this business. We shall show the fallacy of this later on.

First of all, let us see how much heat we really receive in either a cubic foot of gas or a kilowatt-hour of electricity. By insulating the electric appliance against loss of heat we can approach more or less closely to 100 per cent efficiency. With gas, however, it is not possible to approach so closely to the theoretical with a simple appliance, on account of the heat lost in the products of combustion. This waste heat is (1) that required to raise the gas and air to the tem-

perature of the products of combustion amounting to 8 to 10 per cent, (2) the latent heat in the water vapor formed in burning the hydrogen of the gas, and which cannot be recovered in any appliance operating at, or above, the temperature of boiling water. This latent heat is 7 or 8 per cent for gas containing 50 per cent hydrogen. Therefore the highest efficiency we can theoretically attain with ordinary gas for cooking purposes is about 85 per cent. Thus, 600 B.t.u. gas has a net value of approximately 500 B.t.u. Hence, at a 4 cent electric rate, the consumer has delivered at his meter 3412 B.t.u., or 853 B.t.u. for 1 cent. At a 90 cent gas rate he receives 500,000 B.t.u. per thousand or 5556 B.t.u. for 1 cent. That is, the gas man delivers to him for 1 cent, 6.5 times as much (what we might term theoretically usable) heat as the electric.

Since the profits in each case are about the same, gas manufacture must be fundamentally more efficient than electric generation, either from the physical or capital standpoint, or both. If the electricity happens to be generated by an oil-burning steam plant, we may readily compare the physical efficiency of manufacture for both electricity and gas, by taking ratios of heat energy in finished and raw material, since there are no by-products in the electric plant and none of much consequence in the oil gas plant. If it takes nine gallons of oil to make a thousand cubic feet of gas and 10 per cent is lost in distribution, the net efficiency is 37.5 per cent. The very best steam electric plants could scarcely have a yearly efficiency of over 10 per cent from oil barrel to switchboard and 80 per cent efficiency of distribution is high, so the physical efficiency of manufacture and distribution would not be greater than 8 per cent.

Now, if we return to our original figures of 25 per cent and 75 per cent efficiencies for gas and electricity as actually used, we shall find physical efficiencies of 11 per cent and 6 per cent for gas and electricity, respectively. Hence, oil gas manufacturing has, roughly, twice the efficiency of that for electricity as applied for cooking purposes. If we have hydroelectric power the efficiency from water to cooking utensil would vary from about 25 per cent to 45 per cent, depending upon size of plant, length of transmission and general efficiency.

Besides the raw material wasted, which we have just expressed in the term physical efficiency, the cost of manufacture depends upon the efficiencies of capital and of operating expenses. By the efficiency of capital, I mean, the number of units of energy, for example, cubic feet of gas, or kilowatt-hours electricity that can be manufactured and distributed per unit of capital invested. This efficiency, of course, is not an absolute one as is the physical efficiency, but only relative, cause we have no value known to represent 100 per cent.

In order to compare the capital efficiencies of gas and electtric plants we shall find it convenient to express the capacity and output of the gas plant in electrical units, which, of course, amounts to determining the size and cost of an electric system designed to displace a gas system. As you all know, there is no commercially successful means of storing electricity on a large scale in any way comparable with a gas holder, so that at any instant the electric plant cannot generate power in excess of that taken by the consumers, plus the losses; the plant must increase and decrease its output exactly to suit the varying demands of the consumers, with no storage of any sort to fall back upon. The size of an electric plant is thus rated according to its maximum rate of turning out energy, whereas a gas plant is rated according to the amount of gas it manufactures in a given time, for example, in a day. However, the gas actually taken by the consumers varies from hour to hour during the day and unless the generating and distributing system is large enough we can conceive of there being such a great demand over a period of say, one hour, that there would be a tremendous drop in pressure and at the end of the hour, if the demand were severe enough, many consumers, if not all, would be unable to obtain any gas whatever. It is, therefore, not altogether illogical to rate the gas plant in terms of thousands of cubic feet per hour, which will then come pretty close to the idea of an electric plant of so many kilowatts. For we can assume the output from the gas plant over this hour to be uniform and we have seen that a thousand cubic feet of gas are equivalent for cooking purposes to 60 kilowatt-hours, or with 10 per cent loss to 54 kilowatt-hours, delivered. Hence, we may replace our gas plant by an electric one having a capacity of 54 kilowatt-hours, plus electrical losses for each 1000 cubic feet maximum hourly output.

Let us now compare the costs which will be, of course, very general and approximate, but sufficiently accurate for our purpose.

A large gas generating and distributing system will cost approximately $5000 per 1000 cubic feet maximum hourly generating capacity. The cost of an electric system to do the same work for the same capital would have to be $92.50 per kilowatt demand at the meter. Thus a gas system costing $92.50 per unit will carry the same cooking and heating load as a steam electric system costing $250 per unit, or an hydroelectric system at $450 per unit. That is, the gas system capital efficiency is about two and three-quarter times that for the steam electric system and nearly five times that for the hydroelectric.

The preceeding takes into account the assumed efficiencies of the appliances. If we neglect these and consider only the theoretically usable heat, we find that for each 1000 B.t.u. per hour capacity, the gas system requires $10 capital, the steam-electric $73, and the hydroelectric $130, or the relative efficiencies are as 1 to 7 to 13.

While the manufacture and use of gas is, as all of our processes for utilizing natural heat resources, notoriously wasteful, it is a great conserver of these natural resources compared with steam electric transformation as applied to cooking. The opposite is, of course, true for the hydroelectric system. But we see the cost is so great as to preclude it from competition with gas excepting in some special cases, and until either the price of oil goes up considerable or the cost of developing water power and building distributing systems is lowered.

As for operating cost efficiency, we know it to be lower for gas than for electricity—not so much interest, depreciation, maintenance or operating labor per unit as delivered or used.

We have yet one other point to consider. The capital invested in electric systems is very large and hence

the capital costs, interest, depreciation, etc., are a large portion of the total operating costs, particularly in the case of hydroelectric power. Therefore, we must keep our equipment as busy as possible. Now, we have a term called the load factor which tells us how busy our electric plant was during a given time. It is the ratio of the actual kilowatt-hours generated to the number which could have been generated had the plant been loaded to full capacity for that time. This varies from about 25 per cent yearly load factor for a medium-sized plant with a small power load to 40 per cent for large cities like Chicago. The yearly load factor for the Pacific Gas and Electric Company is 60 per cent for the whole system, and a similar company operating in Los Angeles and vicinity has a factor somewhat higher than this. Not very many systems, however, reach even 50 per cent. The more consumers we connect and the more diversified the use to which they put electric service, the better becomes the load factor. But if their maximum demands for power all come at the same time, the load factor is not improved much.

Because people do cooking in the day time and there are obviously a great many prospective consumers in this field, some of the electric men have reasoned that the load factor would be so improved as to greatly reduce the cost of electric power, since the equipment would be kept busier, as it were, and thus the investment charges, which are a large item, would be reduced. However, the actual facts for the case investigated by the writer are, that the yearly cooking and heating peak is simultaneous with the light and power peak and the addition of a large cooking and heating load would really reduce instead of increase the yearly load factor.

For a gas plant supplying a large territory of several hundred thousand inhabitants, I obtained the hourly output for each hour of a day in December, judged to have the maximum hourly output. These hourly outputs I reduced to equivalent kilowatt capacity and thus obtained the load curve which an electric plant would have if the gas plant were entirely done away with, and all the gas cooking and heating done by electricity. I have also plotted in the same way the present total electrical load for approximately the same territory. You will observe what sharp peaks the heating load has. The heating peak comes between 5 and 6 p. m. in summer as well as in winter, whereas the light and power peak comes about 6 p. m. in winter, but about 8:30 p. m. in summer. This is, of course, due to the heavy lighting load shifting according to time of sunset. The power load—that between 7 a. m. and 6 p. m.—is practically the same during the year, but during these hours the heating curves show the present gas load to be much greater for winter than summer. The daily load factor for the three December curves are: Light and power, 59 per cent; heating 33 per cent, and "total," 40 per cent.

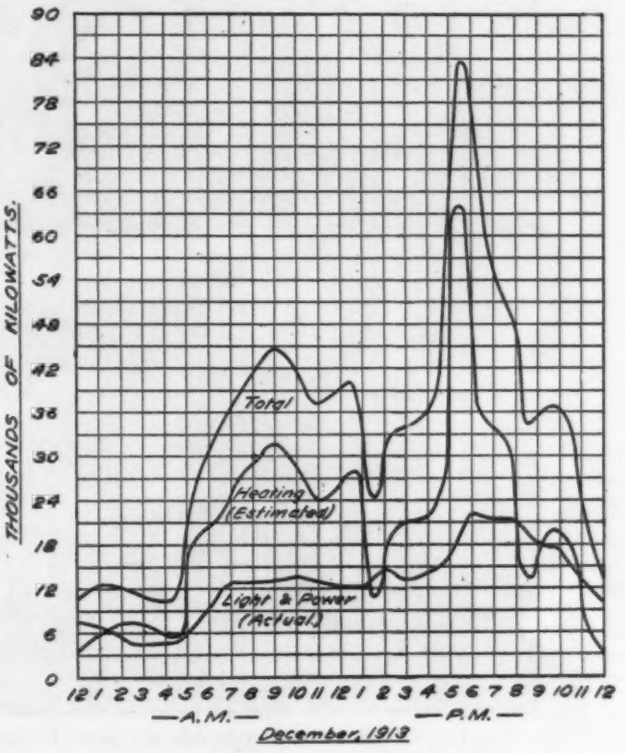
What we really are interested in, however, is the yearly load factor. From the total gas manufactured during the year and the hourly maximum output I have found the gas plant yearly load factor to be 29 per cent. The light and power yearly load factor for the same territory is about 50 per cent. The combined electric peak, if all the gas were to be supplanted by electric heating and cooking, would be 84,000 kilowatt and the yearly load factor 35 per cent.

The increased production would not be able to overcome this heavy reduction in load factor so that the average price per kilowatt-hour would be increased instead of being decreased. Thus since a very large electric cooking business can only be built up by a low cooking rate, rates for other classes of really more profitable business would have to be raised considerably in order to bring up the average and make the plant as a whole profitable.

Summary.

Under special conditions such as aboard ship, and where hydroelectric power is applied principally to seasonal industries, as for example, irrigation work, electricity has the field as regard gas.

In small towns where gas cannot be sold for less than $1.75 per thousand cubic feet, electricity is a competitor of gas, and a very strong one. In this, the electric man is justified in making a determined effort to increase his business by adding cooking devices and he should succeed.



LOAD CURVES FOR A SYSTEM HAVING A LARGE ELECTRIC, COOKING, AND HEATING LOAD

In the larger communities where gas is sold for $1.00, or less, per thousand, electricity has not under present or prospective conditions, much chance to become a competitor of gas to any appreciable extent, for the manufacture and distribution of gas rests upon a much firmer economic basis. The electric central station should not waste any effort in attempting to compete with gas for cooking, where a reasonable gas rate prevails, because a community as a whole cannot, nor will not, sustain an increase in economic loss.

A controversy over aqueduct water rights on Cottonwood Creek in the Owens Valley district has been revived by the Southern Sierras Power Company which has applied to the Forest Service for a right of way along the creek.

INSTALLATION OF HIGH VOLTAGE TRANSFORMERS.

BY C. S. KNOWLES.

(Details are here given of the practical procedure followed by the author in installing transformers for the Pacific Power & Light Company from whose Bulletin these facts are taken and to whose courtesy we are indebted for the cuts.—The Editor.)

The installation of high voltage transformers is one of the most difficult propositions of all electrical practice, as it is necessary to handle them in an upright position, and considerable difficulty is experienced in finding suitable conveyances and block and tackle to move them from railroads to the stations where they are to be installed. I have hauled a five ton transformer 10 miles over bad roads on a farm wagon which was only supposed to handle 2½ tons. I have also hauled a 7½ ton transformer 12 miles and found it necessary to use planks over a good portion of the road to prevent the wagon wheels from cutting through the roadbed. In this case, after about 35 hours of hard work, we covered the 12 miles without mishap, and got within 100 yards of the permanent location of the transformer when it was upset into the river because a snubbing post broke.

Hauling 1000 kw. Transformer to Priest Rapids Plant.

200 kw. Transformer at Coyote Rapids.

Lowering Coils Into 66,000 Volt Transformer.

After high voltage transformers are placed in their permanent positions the work is not completed. It is necessary to make a thorough inspection of the transformer, windings, etc., to see if any displacement has occurred during the trip and to make sure that all foreign matter has been removed from the inside of the case and that all bolts and connections are tight. It is then necessary to remove all moisture from the windings, which may have collected during transit. This moisture is removed by means of air heated to about 90 degrees C, being blown into the bottom of the transformer and allowed to escape at the top, using an ordinary hot air furnace, blowing cold air into the bottom of the furnace and taking the hot air from the top. It is necessary to use a gasoline engine to drive the blower in localities where current cannot be obtained for driving motors. It is then necessary to fill the transformer with oil before the windings have cooled to outside temperature. The drying and filling process usually requires about 50 hours and the transformer is then ready for service.

After the transformer is put in service it should receive a certain amount of attention such as noting the height and temperature of the oil. The height of oil should be kept within the limit of one-half inch from the mark indicated on the gauge glass, and a transformer should never be operated continuously with an oil temperature above 65 degrees C., nor more than two hours with an oil temperature of 75 degrees C. This is in accordance with the manufacturers' guarantee.

Water cooled transformers should never be operated continuously without water, and the cooling water should never be more than 25 degrees C when entering the cooling coils. If water cooled transformers are to be operated without the cooling water for a short period, more care should be exercised to see that the oil does not exceed a temperature of 75 degrees C. When the oil reaches this temperature the transformer should be taken out of service immediately. Serious results are sure to follow if this precaution is not taken.

From past experiences we have found that it is necessary to filter the oil in all transformers over

25,000 volts, at least once a year, for the purpose of removing moisture. We find that oil which tests 40,000 volts across a .2 in. gap will only test between 25,000 volts and 35,000 volts after being in service for a year. We have had transformers operating with oil that did not test 10,000 volts, but this is risky practice. Oil in all high voltage transformers should have a dielectric strength of at least 35,000 volts.

If a transformer is used for stepping down voltage and is protected on the primary side with fuses, and the fuses should blow for some unknown reason, the transformer should be re-fused, making sure that the proper sized fuses are used, and should be again connected with the line. If the fuses blow once more, look for trouble. Do not use larger fuses, as this is apt to ruin the transformer. I know of one place where the transformer was fused with wire solder when a 6 ampere fuse should have been used.

I believe that if due care is exercised in fusing and setting trip coils, a good protection on both high and low sides is provided, and burn-outs due to short circuits and overloads will be reduced to a minimum. Also, I believe that the high tension leads and the tops of transformers should be cleaned at least every month. We have some transformers on our system now which have been in operation over three years and have not been cleaned during all this time.

While mentioning this point, I urge all persons to exercise particular care when working around live transformers. It is essential that every employe should exercise the utmost caution. Never take anything for granted. Never take any chances. Electricity is faster than you are and is no respecter of persons. Every transformer workman should have for his motto: "Safety First."

PAPER PIPES FOR DRYING PLANTS.

A unique method for conveying heated air for drying purposes has been successfully tried out in a San Francisco tannery. The problem was to dry the hides at a minimum of expense for installation and operation.

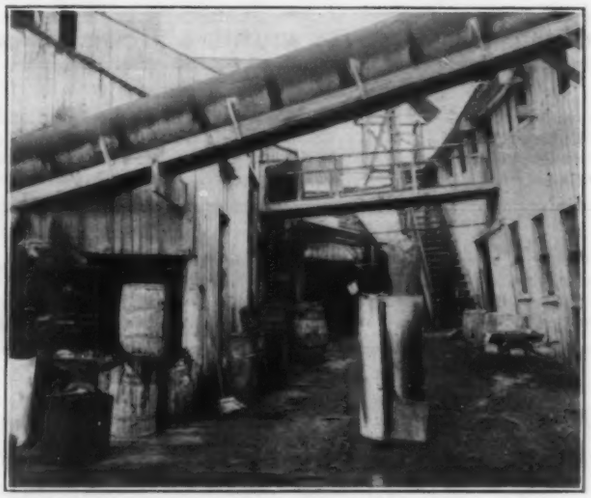
The air is first heated to 110 degrees Fahr. by means of exhaust steam circulating through an old tubular boiler. The exhaust from the reciprocating engine is first used to heat the boiler feed water, then circulates through another heater for hot water for use in the plant and is finally allowed to circulate through the water chambers of the boiler, the condensed water bring drawn off and added to the feed water supply.

Spiral strips of fluted metal have been placed in each fire-tube so as to regulate the intake of air and bring every portion of it in contact with the heating surface. A 40 in. blower is used to exhaust air through the heater and force it through the pipe.

The main supply pipe, as seen in the accompanying illustration, is 2 ft. in diameter and consists of five wrappings of manilla paper with an ample application of glue binding between wrappings.

A wooden form shown in the bottom of the picture, was first made up of 1 in. battens into a truncated cone or cylinder with a taper of ¼ in. to the foot. This taper was necessary so that the pipe may be slipped off when dry. This cylinder was mounted on trunnions, the paper inserted in a slit, afterward filled by a batten, and the whole revolved by a crank. The paper was fed from a roll and the pipe thus made up in3 ft. and 4 ft. lengths. A coat of shellac completed the job, except where the pipe is exposed to the weather when asbestos corrugated board and tarpaper are used for an outside covering.

The short lengths of pipe are fitted together and strips of metal 3 in. wide riveted on at each joint. A sheet iron expansion coupling is provided for about every ten lengths, these couplings also being used as outlets where required. The form of the coupling is shown in the illustration.



Paper Pipe Conveying Heated Air.

Boxes equipped with simple hinge gate valves are set as needed to divert the flow into laterals. The main pipe is 2 ft. in diameter and has a total length of 320 ft., the laterals are 1 ft. in diameter and total 100 ft. in length.

A pressure of about ¾ oz. and a supply of 7000 cu. ft. per minute at 110 degrees is maintained by the fan, this being ample to dry the hides suspended in the lofts. The entire installation cost less than $150, being designed and constructed on the premises by Mr. Frank Pierce, engineer for S. Bloom & Sons Tannery, where it has been giving ample satisfaction for nearly three years.

The material used in the construction of the pipe included 40 lb. shellac, 12 gal. alcohol, 186 lb. glue and 716 lb. paper, the paper being 56 by 72 manilla rope.

The structure of the atom consists of a central nucleus containing a positive charge of electricity and surrounded by concentric rings of negative electrons. The arrangement of the electrons in an atom depends upon the charge carried by the nucleus. Sir Ernest Rutherford, in a recent lecture before the British Association at Sydney, New Zealand, stated that the element lead might have either of two origins, its atomic weight varying accordingly. Two pieces of lead of similar appearance may have quite different physical qualities. Gravitation is probably a property of the nucleus.

JOURNAL OF ELECTRICITY
POWER AND GAS

FOUNDED 1887

PUBLISHED WEEKLY BY THE

Technical Publishing Company

Crossley Building, San Francisco

E. B. STRONG, President and General Manager
A. H. HALLORAN, V. P. and Managing Editor
ROBT. SIBLEY, Treas. and Special Contributor
C. L. CORY, Secretary and Special Contributor
A. M. HUNT, Director and Special Contributor

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TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico	per year,	$2.50
Dominion of Canada	" "	3.50
Other Foreign Countries within the Postal Union	" "	5.00
Single Copies, Current Month	each	.25

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CONTENTS

Arch Illumination at Portland 503

What's Wrong With Municipal Ownership? 504
By Charles A. Warner.

Industrial Uses of Fuel Oil 507
By F. B. Dunn.

Automatic Headlights 510

Meter Deposits 510

A Wireless Telephone 510

Gas vs. Electricity for Cooking 510
By R. C. Powell.

Installation of High Voltage Transformers 514
By C. S. Knowles.

Paper Pipes for Drying Plants 515

Editorials 516
- The Electric Cooking Load.
- What Was Wrong With Private Ownership?
- Engineering Commissioners.

Personals 518

Meeting Notices 518

News of California Railroad Commission 519

News of Idaho Public Service Commission 520

Trade Notes 520

Book Reviews 520

Publications Received 520

California Association Electrical Inspectors 521

New Catalogues 521

Industrials 522
- An Electric Traffic Semaphore.
- A New Clamp.
- New Automatic Pressure Regulator for Starting and Stopping Small Motors.

News Notes 523

The Electric Cooking Load

Much criticism has been directed against central stations for their hesitancy in making rates sufficiently attractive to allow the installation of electric cooking equipment in the homes of city consumers. Many companies in the West have made a low rate in the hope of encouraging this class of business and subsequently have gone back to former rates because the trial, in their estimation, was not satisfactory. In practice it was found that the cooking load overlapped the lighting peak, particularly during the winter months. Additional transformer capacity had to be installed and the expense did not seem to justify the effort. After a strenuous campaign of three months one company succeeded in putting four new consumers on its line and consequently gave the proposition up as a bad job.

The chief difficulty that the new business solicitor met from the prospective electric cooking consumer was the high cost of an electric range as compared with a coal or gas range. This is largely due to the high grade material and finish which must be employed, as well as the expense of manufacturing and selling apparatus for which there is a comparatively limited demand. It consequently seems necessary that an attractive price for the range must precede an attractive rate for the current.

The situation in some of the irrigated districts of the West is somewhat different. The equipment which is necessary to furnish current for pumping service during the irrigation period is idle during the winter months unless a market for cooking or even for heating buildings can be developed. As a result, current is sold in small quantities at a rate as low as one cent per kilowatt-hour.

A rather interesting view of this situation was taken by Mr. P. N. Nunn in testimony given before the Idaho Public Utilities Commission in the matter of the application of the Idaho Power & Light Company and of the Clear Lake Power & Development Company to enter the field served by the Great Shoshone & Twin Falls Water Power Company. Mr. Nunn testified as follows:

"No community can afford long to use electric power for heating, for the reason that whatever may be the cost of developing by water power, there is not water power in the country to supply the demands for power, so the development of energy by steam must become a standard. Now in using coal for steam, we develop electric energy with an efficiency of six, eight, or ten per cent. To turn it back into heat it is being used in competition with heating at an efficiency of fifty or sixty per cent. As a community's use for electricity for the ordinary purposes encroaches upon the surplus of the company, the heating use of electricity must retreat until finally, after the ordinary uses have encroached entirely and absorbed entirely the capacity of the plant, the heating has disappeared and given place to the higher uses of electricity. There are many uses both in town and on the farm which do not now involve the use of power, but for which power will soon be used to great advantage. One thing is certain, in the solution of this great economic question, it will be found that in a community like this it will not pay to use oil and coal

for the pulling of freight trains while we are using the power from water power for electric heating. It will pay better to use the electric power for the railroad and burn the coal or oil for heating."

It should be noted that the opinion refers only to heating buildings and not to cooking food. The rate is one cent per kilowatt-hour or less. There is little or no competition from gas and as a result Idaho has been a most profitable territory for salesmen of electric cooking devices.

There can be no question but what electric cooking is cleaner and handier than any other method yet devised. There are no products of combustion and the efficiency is much greater. Furthermore there is believed to be less loss in the weight of food which is cooked by electric heat. Outweighing these advantages are its admitted greater cost and the longer time necessary to bring the food up to a cooking temperature.

Perhaps one of the fairest and most impartial opinions on this mooted question is that by Mr. R. C. Powell elsewhere in this issue. He concludes that there is a large field for both electric cooking in small towns and agricultural districts, but that it cannot compete with gas in the larger cities. The facts upon which these conclusions are based are most interesting and worthy of the careful attention of every central station man.

What was Wrong with Private Ownership

In an able paper about what is wrong with municipal ownership of public utilities, published elsewhere in this issue, Mr. Chas. W. Warner incidentally draws an excellent picture of what used to be wrong with private ownership. The former mistakes of private ownership, which were largely responsible for the agitation for public ownership, have since been remedied by private plants, but are now being repeated by many municipal plants. The great error in municipal ownership is the failure to profit from the mistakes of private ownership.

The men who had the initiative and ability to develop technical utilities were seldom able to handle the public. The tactics which were successful in harnessing the water fall and subjugating steam were not adapted to harmonizing the public. Politicians were quick to capitalize the accumulated resentment of the public against the early utility developers but continue to make the mistake of applying political methods in the public service.

Meanwhile the corporations, profiting from their early mistakes in antagonizing the public, are now steadily studying how to please them. Public relation engineers are employed to establish confidence, courtesy and tact are inculcated in employees, and every endeavor is made to bring about friendly relations.

Such a policy, as compared with the indifference and inefficiency of many municipal enterprises, will ultimately win out. The idea of a corporation with a soul is being exemplified every day by a sympathetic understanding of public needs and a broadness of vision which recognizes the rights of others. Most private utilities are now conducted more closely in accord with the dictates of public welfare than the municipally operated.

The conclusion may therefore be drawn that what was wrong with private ownership has been corrected. Likewise that what is wrong with municipal ownership must be corrected.

Public ownership, in itself, is good. If public funds are available after schools, streets, sewers, police and fire protection have been provided, the other necessities which appear as the concomitant of civilization should also be publicly owned. Private initiative and capital have made the preliminary expensive experiments, so that public ownership may be undertaken without serious risk. But private ownership of quasi-public utilities should not be discouraged until after all public necessities are publicly owned. Nevada, for instance, classifies sewers as a public utility which may be furnished by private enterprise and has given the public service commission jurisdiction over them.

If public ownership, in itself, is good, what is wrong with it? Concisely stated, the answer is political operation. If all the evils of municipal ownership can be traced to political operation, why not abolish it? Private operation of publicly owned utilities, as has been repeatedly demonstrated in these columns, is the one logical answer to this problem.

Engineering Commissioners

The engineers have lost another opportunity for having engineering representation on public service commissions in Western states. In Idaho the appointment has gone to John W. Graham, a lawyer, and in California no engineer has yet been announced among the probable appointees.

While no one can object to the presence of representative lawyers and business men on the public utility commissions, it seems no more than right that an engineer should also be included. Telephone, telegraph, gas, electric and railway projects all depend upon engineers for their construction and operation. Valuation and rate making are essentially engineering problems. The training of an engineer is such as to make him an earnest seeker after facts and to give him the ability to determine their proper weight in making decisions. Many of the witnesses in important cases are engineers and their testimony can be interpreted more intelligently by engineers than by lawyers.

According to the present system, appointment to a public service commission is usually regarded as a legitimate method of balancing political debts. Its effect, however, is to unbalance the commission.

The logical answer, of course, is for engineers to enter into politics. Engineering ethics are such as to prevent the individual from seeking office. Yet it is possible for engineering societies to take concerted action on this matter and carry on a campaign to educate the people regarding the fact that an engineering member is desirable on every commission. There has been much talk on this subject in the past but now is the time for action.

PERSONALS

Geo. J. Henry recently returned to San Francisco from a short business trip to Los Angeles.

J. T. Stewart, salesman, Holophane Company of San Francisco, is traveling throughout the Pacific Northwest.

O. E. Clark, district manager, Pacific Gas & Electric Company of Napa, is a recent business visitor at San Francisco.

William Shore, manager of the Montesano Telephone Company of Montesano, Wash., was a recent Tacoma visitor.

Clark Pomeroy recently joined the forces of the Electric Railway and Manufacturers' Supply Company at San Francisco.

E. W. Yerger of the Los Angeles office of H. B. Squires Company has just returned from a hurried trip to his home in Cincinnati, Ohio.

C. H. Johnson, Pacific Coast manager C. A. Wood, Preserver Company of San Francisco, is traveling throughout the San Joaquin Valley.

P. H. Affolter, manager electrical department, Fairbanks, Morse & Company, has returned to San Francisco. He spent the past week throughout the Sacramento Valley.

H. F. Yost, representative Electric Railway and Manufacturers' Supply Company of San Francisco, recently returned from a successful business trip throughout Nevala.

John A. Britton, vice-president and general manager, Pacific Gas & Electric Company of San Francisco, left for the East the latter part of the week to be gone about three weeks.

W. D. Peaslee, formerly with the Seattle and Portland offices of the General Electric Company, is now with the school of electrical engineering at the Oregon Agricultural College.

H. V. Carter, president Pacific States Electric Company, left for the East the latter part of the week to attend the national jobbers' convention to be held in Birmingham, Alabama.

A. J. Myers, Pacific Coast manager Wagner Electric Manufacturing Company expects to return to San Francisco about the first of the week from Los Angeles, where he has been for the past week.

A. S. Halls, manager electrical department of the Pacific Fire Extinguisher Company at Portland, and **H. P. Miller,** manager of the same department at Vancouver, B. C., have recently resigned from that company and have gone in for themselves contracting, with headquarters at Portland.

J. Paulding Edwards, Fellow American Society Electrical Engineers, after an absence of almost fifteen years from his native city, has recently established offices in the Flatiron Building, San Francisco, as consulting engineer and electric railroad specialist. Mr. Edwards for many years past has been connected with the Northern Electric Railway as consulting and operating engineer.

Richard Sachse has been appointed chief engineer of the California Railroad Commission in San Francisco. Mr. Sachse entered the service of the commission in 1911 as assistant engineer; was promoted to the position of principal assistant engineer in 1913; and was acting chief engineer since December, 1913. Prior to his service with the commission he had been with the Western Pacific Railway Company, the Southern Pacific Company and the United States Reclamation Service.

John W. Graham of Twin Falls, Idaho, will fill the vacancy left on the Idaho public utilities commission by the recent resignation of Judge D. W. Standrod. Mr. Graham has been practicing law in Idaho for the past four years. He is 41 years of age and a native of Canada, but was educated at the University of Nebraska. He practiced his profession in Fremont, Dodge County, Neb., and was for four years prosecuting attorney of that county, and had altogether 15 years' experience as a lawyer. The appointment which he has just accepted will hold until four years from the first Monday of January, 1915, since Judge Standrod held the long term on the utilities commission.

MEETING NOTICES.

Oregon Irrigation Congress.

The fourth annual session of the Oregon Irrigation Congress will be held at Imperial hotel, Portland, on January 7, 8 and 9, 1915.

San Francisco Section A. S. M. E.

A meeting of the American Society of Mechanical Engineers will be held at the Engineers' Club. Hotel Sutter, San Francisco, 8 p. m., Dec. 8. Mr. A. H. Babcock will present a paper on "A Novel Method of Handling Boilers to Prevent Scale and Corrosion."

Electrical Contractors' Association.

The Electrical Contractors' Association of Oregon has called a convention to meet at Albany, Oregon, December 9, and invites all members of state and local associations to be present. The purpose is to consolidate all such associations in one state organization which shall be affiliated with the national association of electrical contractors.

Utah Society of Engineers.

The Utah Society of Engineers held its monthly meeting Friday, November 20th, at Salt Lake City. The feature of the occasion was the reading, by State Engineer W. D. Beers of a paper on the history of water legislation in Utah. From the standpoint of an administrator he pointed out the defects of the present law. He suggested that a commission composed of representatives from varied interests and professions which have to deal with water in its manifold uses, be created by the legislature to study conditions, and make recommendations to the incoming legislature. The speaker said that titles to land at present were reasonably secure, but titles to water are indefinite and insecure.

Assistant State Engineer C. J. Ullrich commented on the administrative difficulties of the state engineer's office in dealing with water questions. Guy Sterling called attention to the need of further study of the proper amount of water for the various crops. Horace W. Shelly exhibited maps of irrigated lands near Monticello, Utah, where water rights are in course of arbitration. A committee to advocate needed legislation was appointed. It consists of Horace W. Shelly, chairman, Dr. Joseph F. Merrill, F. W. Moore, and O. W. Ott, to act in city, county and state matters. City Engineer Sylvester Q. Cannon presided at the meeting.

Oregon Society of Engineers.

The regular Monday luncheon of the Oregon Society of Engineers, held November 23rd, at the Benson Hotel, was presided over by Mr. W. H. Crawford, manager Portland branch Chas. C. Moore & Company, Engineers. The speaker of the day was Mr. John F. Carroll, editor-in-chief of the Evening Telegram. His subject was "A Note of Optimism." Mr. Carroll said that he could not see why any one should have any other perspective except an optimistic one, in the United States. He said "hard times" should be considered the best thing than can happen to a country and an individual, as it brought out their powers and resources and only a coward would "lay down" and lament his fate.

The Jovian Electrical League of Southern Califronia.

The weekly luncheon of the league, held at Christopher's, Los Angeles, on Wednesday, November 25th, was attended by about 125 Jovians and a number of visitors. A letter from Jupiter Niesz was read in which he speaks in glowing terms of last year's record of the league and urges the officers on to even greater efforts. A course of free lectures on alternating currents at the Polytechnic High School was announced by Mr. Rogan. A splendid musical program was provided by

C. H. P. Dellman, the chairman of the day. Then followed three breezy three-minute talks by H. B. Lynch on S. J. Keese of the Westinghouse Company, R. H. Manahan on E. R. Northmore of the Los Angeles Gas and Electric Corporation, and J. E. Barker on T. E. Burger of the Western Electric Company. A large iron cross, presented to Tribune Pieper during the early part of the luncheon, was transferred by him several times during the progress of these little talks. A splendid lecture was then delivered by Judge Thos. P. White on "The Woman's Court and Humane Justice." As the originator of the Woman's Court, the Judge was in a position to not only present many arguments in its favor, but he pointed out its numerous beneficent effects in the past on offending women and children. He dwelt on the importance of the police courts and the human responsibility of the police judge, who comes in contact daily with first and frequently petty offenders. How he should, in many cases, supplant parenthood and rather guide than sentence, appealing to a prisoner's intellect and his or her desire to do what is right if the right course is pointed out to him or her. The main questions to place before ourselves are: "Who are we, what are we, and whither are we going?" After listening to the Judge's strong appeal for greater police protection for Los Angeles, the league recommended the subject for action to its newly appointed Civic Committee.

California Association of Electrical Contractors.

When the California Association of Electrical Contractors and Dealers completed its new by-laws the conclusion was reached that the meetings were too far apart to obtain the proper co-operative effort, and the getting together of the contractors throughout the state. As the result, it was decided to hold quarterly meetings; two in the northern part of the state and two in the southern part of the state each year. The first quarterly meeting of the sixth year was held at Los Angeles, California, November 13, 1914, at Christopher's Cafe. Members from all parts of the state gathered at Los Angeles, and a most enthusiastic meeting lasting for two days was held.

The first day consisted of the meeting of the executive committee, at which the financial affairs of the association were considered. On the next day the entire association met, and reports from the Standardization, Compensation Insurance, Architects, State License, and Segregation Committees were taken up and acted on. The report of the secretary showed that the association had a steady growth the past quarter; twenty members being added to the list. The next quarterly meeting will be held at Oakland, California, just previous to the opening of the Panama-Pacific Exposition.

The open meeting was called to order November 14th, by J. C. Rendler, president of the Los Angeles Section. Mr. Rendler, in a few remarks of welcome, introduced Mr. Spring, of the Western Electric Company, who read the paper on "Co-Operation" as prepared by the joint committee of Jobbers and Contractors. Mr. Rendler stated this paper represented the principles of the association and that if there was any individual present that was not in sympathy with this movement, that they had the privilege of retiring. There were a large gathering consisting of jobbers, manufacturers, and contractors present and it was gratifying that all remained.

Mr. Rendler then introduced as the speaker of the day W. L. Goodwin, vice-president and general salesmanager of the Pacific States Electric Company. Mr. Goodwin briefly outlined his views of the work of the association; what was expected to be accomplished by same, and how it could be accomplished. Questions were "fired" at him from all sides, which he carefully answered, in fact he was kept talking for nearly four hours.

Among those who made short talks and brought out Mr. Goodwin's points were Ralph Clapp, representing a manufacturer. Messrs. Rendler, Gilpin, Somers, Boynton, Schneider, Foulkes, Gribble and Arbogast, representing the contractors, and Mr. Burger and Mr. Reynolds representing jobbers. Among the visitors present who came from the northern part of the state were Messrs. Goodwin, Alvord, Gregory and Steele.

While it had been planned that there would be no regular entertainment at this convention, still the visitors were royally entertained by the members in the south. On Friday evening, November 13th, Mr. Alvord of the General Electric Company, gave a dinner in the Bristol Cafe. After dinner under the guidance of Mr. J. C. Rendler, an auto trip was made to Venice and dancing was enjoyed until the wee hours of the morning. Saturday noon a luncheon was given by the Los Angeles Contractors and their local meeting was held immediately after.

This meeting was one of the best ever held in the southern part of the state, and the reports of the different committees, who were actively at work, were well worth listening to, as they showed that the work outlined by the state association could accomplish great things for local associations when the local members showed a willingness to work. Saturday evening the contractors were entertained at dinner at the Jonathan Club by Messrs. Foulkes and Arbogast. Sunday was spent in an auto trip throughout the different parts of Los Angeles.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

The Oakland, Antioch & Eastern Railway has filed an application with the commission requesting authority to renew certain promissory notes amounting to $295,345.28.

The city of Los Angeles has filed an application with the commission, asking that the commission fix a price to be paid by the city of Los Angeles for the distributing system of the Southern California Edison Company within the city limits of Los Angeles and in certain adjoining territory. The city of Los Angeles proposes to acquire the distributing system of the Southern California Edison Company to be used for the distribution of the hydroelectric power which the municipality will develop in connection with its aqueduct. The city authorities propose to acquire the distribution system by condemnation, and in contemplation of this procedure, the city has asked the commission to fix the compensation to be paid for the properties to be taken over.

The Rodeo Land & Water Company of Beverly Hills, Los Angeles county, has filed an application with the commission requesting authority to sell its water, gas and electric systems to the Beverly Hills Utilities Company in return for $200,000 capital stock of the latter company.

The commission has rendered a decision denying the application of the Hawthorne Electric & Water Company, Los Angeles county, to issue $18,000 of stock and a sufficient amount of 5 per cent bonds to refund $32,570.33 of promissory notes.

The Western States Gas & Electric Company, operating in Stockton, Eureka and vicinity, has filed an application with the commission requesting authority to renew certain promissory notes amounting to $45,000 held by H. M. Byllesby & Company.

The commission has rendered a decision authorizing the Pacific Electric Railway Company to issue $2,942,000 of its refunding mortgage 50 year gold bonds at not less than 87½ per cent of face value and accrued interest. The company proposes to use the proceeds from the sale of these bonds in reimbursing its treasury for expenditures made for betterments and additions.

The Central California Gas Company has filed an application with the commission requesting authority to issue $8000 of its bonds at not less than 90, and $8800 of its common capital stock at 80. The company proposes to use the proceeds from the sale of these securities in defraying the cost of additions to its plant and distributing system.

NEWS OF IDAHO PUBLIC SERVICE COMMISSION.

In special session held Thursday, November 19th, the Boise council passed resolutions addressed to the public utilities commission asking that no undue burden of expense be put upon the electric companies operating in Boise in connection with the building, maintenance or extension of the transmission or distributing systems.

These resolutions come as a result of the informal conference on the matter held by members of the council on Wednesday afternoon, when it was shown to them that the telephone company had made application to the public utilities commission to compel the electric companies, wherever their lines carrying 5000 or more voltage, crossed above or under the wires of the telephone company, to either place their wires in an underground conduit or to insulate them as to thoroughly protect the wires of the telephone company.

The resolutions further ask that the public utilities commission show no more favor to the telephone company than that accorded the electric companies, and the mayor of the city is authorized to attend the forthcoming hearing of the commission and to present a copy of the resolution at that hearing.

The Idaho Public Utilities Commission has entered an order lowering the light rates of the Washington Water Power Company in several northern Idaho towns. The new rates will be as follows: First eight kw. hours per month or less $1.00; next 12 kw. hours per month, 11 cents; next 10 kw. hours per month, 10 cents; all over 30 kw. hours per month, 8 cents.

Rates which the company asserts are reductions from the present ones have been filed with the commission by the Pacific Telephone & Telegraph Company for its telephone service. They did not fully comply with the rules of the commission, so were returned for completion. As expressed by the letter which accompanies the schedules, the company has 650 one-way routes in the state. Of these the rate on 498 is decreased; 142 are unchanged, and 10 are increased. The decreases range from 5 to 20c for the initial period, and the increases are 5c. There appears to be a qualification to the statement that the company's rates are decreased, however. This lies in the fact that, although there is a decrease in the rate for the initial period, there is also a decrease in the time of the initial period, which appears to make the rate higher. For instance, where in the past the rate for the initial period has been 25c, the period has been three minutes. Under the new rates, in some cases the rates are lowered to 10c, but the period is made one minute. Thus for the three minutes for which it was necessary to pay in the first instance the cost would not be 15c for the first minute and 10c each for the last two, making a total of 35c where in the past it has been but 25c. In some cases, however, the rates are lower, and if the conversation lasts but one minute, they are lowered in the number of cases which the company mentions.

BOOKS RECEIVED.

"Practical Lessons in Electricity," by Robert A. Millikan, Francis B. Crocker and John Mills; 318 pp.; 5½x8½ in. Published by American Technical Society, Chicago, and for sale by Technical Book Shop, San Francisco. Price $1.50.

The fundamental facts of electricity are here presented in readable form. The book is divided into four distinct parts, elements of electricity and magnetism, direct current dynamos, elements of alternating currents and storage batteries. It is written primarily for self-instruction and for the practical worker, many illustrations and diagrams facilitating the study. Though written in semi-popular style, the statements are technically accurate. This feature, combined with the low price for a book of this magnitude, should make it of value to many workers and students.

TRADE NOTES.

The electrical contract for the new high school building being erected in Eugene, Oregon, has been awarded the Comet Electric Company of Eugene, Oregon.

The electrical contract on the new Eugene armory, being erected in Eugene, Oregon, has been awarded to the W. A. Kraner, Chamber of Commerce Building, Portland, Oregon.

The W. A. Kraner Company, Chamber of Commerce Building, Portland, Oregon, has received the electrical contract for the wiring of the warehouse on Municipal Dock No. 1, Portland, Oregon.

The contract for the construction of an ornamental lighting system on Fair Oaks avenue and the north side of Huntington drive, from Oneonta station to South Pasadena, has been let to the W. A. McNally Company of Pasadena for $15,948.

The Ne Page, McKenny Company, Oregonian Building, Portland, has been awarded the contract for the electrical installation in the new Meier & Frank Company's building being erected in Portland, Oregon. This is a department store building and the value of the contract is approximately $45,000.

John Mullen, a veteran miner of the Park City district, and associates of Salt Lake, have practically completed arrangements for the installation of an electric hoist on his Altmore property, three miles west of Springdale, in Nye county, Nevada. Mr. Mullen has been using a windlass and the present depth of the shaft makes it practically impossible to proceed further with that method of hoisting. A contract has been entered into with the power company at Bishop for the necessary electric power. Shipments are to be started as soon as the work of installing the hoist has been completed.

PUBLICATIONS RECEIVED.

"Fifth Annual Report of the Board of Supervising Engineers, Chicago Traction," 267 pp., 6x9 in., comprises the final report of Bion J. Arnold, the chief engineer of the rehabilitation work authorized by the traction ordinances of 1907. Results are summarized and analyzed, and valuable details are given of construction and operation.

"Industrial Gas Calorimetry," Technologic Paper No. 36, from U. S. Bureau of Standards, by C. W. Weidner and E. F. Mueller, 150 pp., 7x10 in., gives details of tests on nine types of gas calorimeters, furnishing gas engineers, public service commissions and gas inspectors exact information as to the accuracy obtainable with the instruments, the sources of error and precautions to be used.

The U. S. Bureau of Standards have published several new scientific papers. No. 227 is concerned with "Measurements on Standards of Radiation in Absolute Value," by W. W. Coblentz. No. 228 is an "Experimental Study of the Koepsel Permeameter," by C. W. Barrows. No. 229 describes "Various Modifications of Bismuth-Silver Thermopiles Having a Continuous Absorbing Surface," by W. W. Coblentz.

The Bureau of Standards' Technologic Paper No. 41 by R. S. McBride and J. D. Edwards deals with "The Lead Acetate Test for Hydrogen Sulphide in Gas." The effect of the following factors upon the results obtained in tests for the detection of hydrogen sulphide in gas by the lead acetate test have been investigated: (1) The paper: Kind; method of its preparation, including the strength of lead acetate solution used; and the moisture content when used. (2) The gas: Its humidity, and the period and rate of flow. (3) The apparatus: Its form and size, as determining the circulation of gas with respect to the paper. The conclusions reached in regard to the effect of these various factors are given in full. A single apparatus for carrying out the test is described and specifications for carrying out the test in such a way that the results will be of quantitative significance are given.

CALIFORNIA ASSOCIATION OF ELECTRICAL INSPECTORS

Section of N. A. E. I.

C. W. Mitchell, President. Arthur Kempston.
Wm. G. Pennycook, Vice-Pres. B. C. Hill, Executive Comm.
John W. Carrell, Secretary-Treasurer, 814 Scott, San Francisco.

The purpose of this organization is to standardize the common practice in electrical construction with the National Code as the general standard.

Questions pertaining to electrical construction will be answered in these columns, but only from the point of view of the Code. This is a voluntary organization and the answers published under this heading must not be construed as authoritative, or binding. No attempt will be made to correllate the answer from the several Inspection Districts, as an occasional difference of opinion will tend to induce further study on subjects. All questions will be passed upon by an executive committee.

Address all communications to the secretary.

By the Secretary.

Members of the association and others desiring to suggest changes in the National Electrical Code through the C. A. E. I. should forward same to secretary before January 1, 1915.

The C. A. E. I. met in Council Chambers, City Hall, Berkeley, Saturday, November 28th. The discussion was on desired changes in the Code. The chief result of the meeting was a resolution requesting that the Code Committee use every reasonable effort to group and condense the rules on wiring of buildings. A few of the many conditions on which this resolution is based follow:

The provisions for service wiring from overhead lines are contained in rule 12 for outside work.

The provisions for knob and tube work are contained in rules 16 and 26.

The provisions for switches and cut-outs are contained in rules 19, 23 and 24.

The rules for metallic armor systems contain many similar provisions which could be generalized.

The provisions requiring metal cabinets with conduit, armored cable and metal moulding systems is contained in the material section of the Code, i. e., No. 70, Class D.

Experience shows that electrical men, usually able to keep well informed on the many other subjects pertaining to their business, are unable to maintain an accurate knowledge of the Code and also that many wrong impressions are formed through failure to read all rules on certain points. The general situation is like the first reader story of an elephant and six blind men. Each blind man carefully inspected that portion of the elephant's anatomy which was nearest him. Each received a different impression of what an elephant was like. Because all had first-hand information each was very certain that his impression was correct. It wasn't the fault of the men, because they could not see. The elephant was all there, but it was hard to find all of him. Of course the comparison must not be taken too literally, as there are few blind men in the electrical industry.

Were the Code more condensed and made more convenient for reference, most of the unintentional violations of rules (a large percentage of the total infractions) would be avoided; fox-like, minimum requirement contractors would have less opportunity to misconstrue rules; book-worm inspectors would have less lee-way to combine technical phrases into dogmatic enigmas, and the need of special installation rules would be reduced.

NEW CATALOGUES.

Wagner Electric Manufacturing Company is distributing two striking pamphlets giving pertinent facts and illustrating the economy of Wagner single-phase motors.

"An Electrical Xmas" is the subject of an interesting pamphlet being distributed by the Western Electric Company and giving suggestions for electrical gifts.

Cutler-Hammer Manufacturing Company of Milwaukee, Wis., are distributing an interesting booklet about Electrical Equipment for the Theater, particular attention being given to light dimmers and motor controllers.

The Westinghouse Electric & Manufacturing Company, East Pittsburg, Pa., has recently issued the following publications: Folder 4287—"Westinghouse Electric Drive for Flour Mills." This little publication describes the use of electric power in flour mills, showing curves illustrating the energy used in mills of various kinds throughout typical days of operation. The equipment used for different mills is also given. Folder 4152 illustrates and describes the Westinghouse Sewing Machine Motor, its application and operation. Numerous views are shown illustrating the method of attaching the motor to different types of machines. Folder 4286—"Westinghouse Insulating Tapes"—describes briefly the different classes of friction tape, armature tape, and splicing compounds that are furnished by the company.

The General Electric Company has issued Bulletin No. 48015 illustrating and describing its Type M. Transformer for Operating Electric Stop-Motion of Textile Machinery. Bulletin No. 41500, describes that company's Small Direct and Alternating Current Motors of the Drawn Shell Type. These motors range in capacity from 1/30 to 1/4 h.p., inclusive. Bulletin No. 44404, describes the new line of Ventilated Commutating Pole Motors. This motor has a rated capacity of 80 h.p. on 600 volts, but, due to the special feature of induced ventilation, has a greater service capacity than motors of the closed type having the same hourly rating. A description of the motors is given in more or less condensed form, but a more detailed description is given in the company's bulletin A-4171. The new bulletin contains a schedule of speed tables and characteristic curves of the motor. No. 40500 is devoted to the subject of Alternating Current Generators for Direct Connection to Reciprocating Engines. The object of the bulletin is to illustrate and describe some of the recent improvements in the alternators built by the company for direct connection to steam, oil and gas engines. The construction of the alternator is illustrated and described in considerable detail, and the bulletin contains data relative to dimensions, capacities, weights, etc., of alternators of this description.

The General Electric Company has just issued an attractive illustrated bulletin devoted to Modern Electric Railway Apparatus. The bulletin is contained in a colored cover of artistic design, and describes, briefly, the Curtis steam turbine for railway service, railway generator, transformers, switchboards, synchronous converters, motor-generator sets, G-E ventilated railway motors, electric locomotives, and contains illustrations of the G-E locomotives, in use at the locks of the Panama Canal. The number of the bulletin is .44003. Bulletin No. 44300 illustrates and describes some of the Gas-Electric Motor Cars and Locomotives built by the company. The power equipment is described in considerable detail in the bulletin and average cost of operation of the standard car is given, in addition to other data relative to weights, dimensions, etc. Bulletins No. 44403 and 44405, describe Ventilated Commutating Pole Railway Motors for 600 and 600/1200 volt service. Bulletin 44403 is devoted to the GE-222-G Railway Motor which has a rated output of 140 h.p. at 600 volts, and, having modified windings, can be supplied for operation with two in series on 1200 volts, at which voltage the rating is 130 h.p. Bulletin 44405 describes the GE-233-A motor for operating two in series on 1200 volts. This has an hourly rating of 75 h.p. Bulletin No. 46018, which describes a Portable Voltmeter, known as Type P-8. This is an unusually small instrument inclosed in a mahogany case, and suitable for use on both alternating and direct current. The bulletin describes the instrument in considerable detail, and includes a reproduction of the scale in actual size.

INDUSTRIAL

AN ELECTRIC TRAFFIC SEMAPHORE.

An electric traffic semaphore has recently been installed at Third and Market streets, San Francisco in an effort to solve traffic difficulties. It is operated by a policeman standing at the safety station. A mere pressing of a button turns

Electrically Operated Traffic Semaphore.

the arrow and rings one or two bells, as the case may require. The arrow is lighted at night and is also connected so as to continuously revolve and ring in case of a fire alarm, thus clearing the street.

The exhausting effect of the old system of blowing a whistle is well known and may be entirely eliminated by this system.

This is hung from above so as not to obstruct traffic. An automatic air whistle can be substituted for the bell if considered desirable. This is the invention of B. M. Harris of San Francisco and the mechanical details have been worked out by Geo. Blanchard of Busch Manufacturing Company of San Francisco.

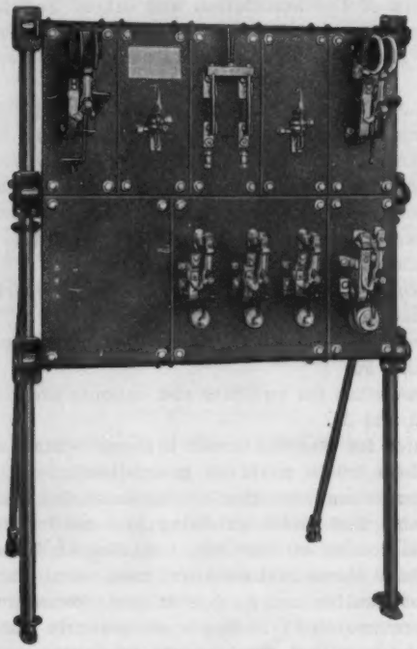
A NEW CLAMP.

Mathias Klein & Sons, tool manufacturers, Chicago, has perfected and is now marketing an improved Klein Haven's clamp adapted for handling plain or stranded wire or cables up to ¾ in. in diameter. The particular feature of construction is the addition of a swing latch which engages with stud on the lower jaw, thus centralizing the pressure on the cross-bolt which is strongly made of turned machined steel. The body and handle of the clamp are made of steel forging and the eccentric of hardened tool steel. This tool is the outgrowth of a demand for a clamp to accommodate larger than ½ in. cable.

A New Clamp.

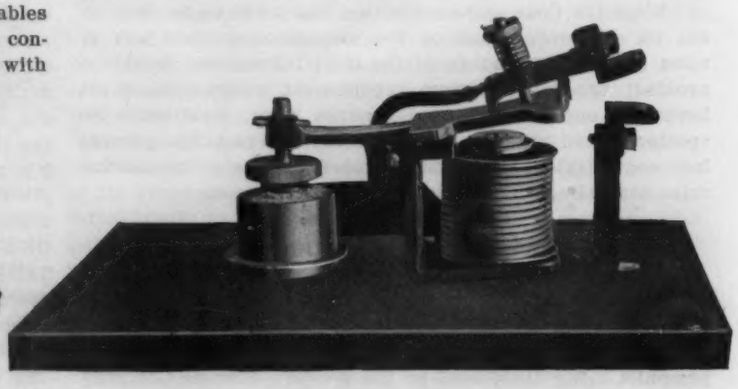
NEW AUTOMATIC PRESSURE REGULATOR FOR STARTING AND STOPPING SMALL MOTORS.

The double-pole diaphragm type pressure regulator illustrated below is a new device for automatically controlling small direct or alternating current motors operating on pres-



Switchboard Upon Which Pressure Regulator Is Mounted.

sure systems. This regulator stops the motor when the maximum pressure desired is reached and starts it again when the pressure drops to the low value for which it is set. For capacities within the limits for which it is designed (1 h.p. for d.c. and 5 h.p. for a.c. motors) this regulator controls the operation of the motor without an additional magnetic switch and automatically maintains pressure in the system between given limits. It is made by The Cutler-Hammer Manufacturing Company of Milwaukee.



Detail of Automatic Pressure Regulator.

NEWS NOTES

INCORPORATIONS.

FOX, ORE.—A Joint Stock Telephone Company has been organized for the construction of a telephone line between Beech Creek and Fox. T. S. Kirkpatrick is president; W. H. Shank, treasurer; John Hiatt, secretary.

SEATTLE, WASH.—The Electric Fixture & Construction Company has been incorporated at Seattle, with a capitalization of $3,500, by T. J. Madlen and R. K. Le Grand. A. S. Hansen, Leary Building, is attorney.

VANCOUVER, WASH.—Articles of incorporation have been filed with the county auditor for the Hayes-Etna Telephone Company with a capital stock of $3600. The company contemplates constructing and operating a telephone line between Hayes and Etna.

SPOKANE, WASH.—Malloy Prairie Telephone & Telegraph Company has been formed at Medical Lake, with a capitalization of $1000, by W. E. Wood, Joseph Tucker, J. W. Ward, C. E. Svenson and J. W. Goodykoontz. John Salisbury, 503 Rookery, Spokane, is attorney.

MALTA, MONT.—Articles of incorporation have been filed by the Malta Light Company to carry on business of electricians, electrical engineers and dealers in electricity and electric motive power for lighting, heating, etc.; $10,000 is the capital stock. John Shady, R. J. McCreary, B. M. Phillips and others, are directors.

FINANCIAL.

OAKLAND, CAL.—A plan for meeting the financial requirements of the Oakland, Antioch & Eastern Railroad during the next three years is embodied in a letter being circulated among security holders of the company. The plan involves a three year note issue, secured by bonds, two for one, and paying 6 per cent interest, semi-annually. The stockholders, if the plan becomes effective, agree to pay in $3 per share over a period of a year and one-half in place of the $1.50 assessment falling due in January, and to be secured by notes of the above issue for equal amount. The bondholders agree to receive for their interest, as their coupons mature, notes of the above issue, to the amount receivable by them, in equal amount to the sum total of their coupons as they mature. The company has the privilege of selling the bonds held as security for these notes at not less than 80 and distributing to the noteholders the proceeds.

OAKLAND, CAL.—A permanent reorganization committee has been appointed to put into effect plans for refinancing the Peoples Water Company. The committee consists of C. O. G. Miller, F. W. Van Sicklen, Percy T. Morgan, John A. Hooper, E. J. McCutcheon, P. E. Bowles, W. W. Garthwaite and John S. Drum. The plan agreed upon at a conference between the several committees and the security holders is a modification of the so-called Drum plan. Under the new plan the proposed bond issue will be $12,000,000 instead of $12,500,000, and the new bonds will be issued at par instead of 95, drawing interest at 6 per cent instead of 5 per cent. The bonds are to be callable during the first ten years on one year's notice at 100 instead of 102½. The July coupons on the $5,600,000 underlying bonds and also the coupons maturing next January will be payable in cash. People's Water bonds will be exchangeable for 11 shares of new stock instead of 10½ shares, and People's preferred will be exchangeable for new common on the basis of 5 for 1 instead of 8 for 1; $100,000 of the new common stock will be turned over to the holders of the old common stock in exchange for their interest.

SAN FRANCISCO, CAL.—An audit of the books of the San Francisco-Oakland Terminal Railways which is now in control of the holders of its collateral notes, has been completed by Price, Waterhouse & Company. The figures are for the year ended June 30, 1914. Gross earnings were found to be $4,515,798, with operating expenses of $2,929,920 and net earnings of $1,472,841, including $125,963 of miscellaneous income. Interest charges on bonds and notes aggregated $1,057,499 and discount on notes sold was $10,491, leaving net profit for the year $404,950. If interest of $240,101 charged to capital account on construction in progress is included the balance carried to surplus account for the year was $644,952. In the year $510,927 was charged to capital account for road and $105,922 for equipment, making total capital expenditures $616,850. This was after considerable writing down of land values and charging off of abandoned structures. The total amount of bonds outstanding as of June 30 was $16,656,000 in the hands of the public and $3,256,000 pledged as security for the Oakland Railway notes, a total of $19,912,000. Net profits from operation for the year, after charging off all interest, including interest properly chargeable to capital account, does not provide for sinking fund payments. It appears, therefore, that while the company is amply able to maintain itself in excellent operating condition it is not in position to undertake new construction without new capital. Maintenance charges appear to be ample, as $400,972 for maintenance of structures and $284,080 for maintenance of equipment, were charged against operating expenses in the year.

ILLUMINATION.

STITES, IDAHO.—H. D. Millard has been granted the right to install a system for the distribution of electric power in this village.

GLENDALE, CAL.—An ornamental lighting petition has been signed by property owners on Brand boulevard from Colorado street to the south city limits.

HEBER, CAL.—The Commercial Club has awarded the Imperial Valley Improvement Company the contract for the installation of electric lights on Main street.

RIVERSIDE, WASH.—J. R. Morris of the Riverside Lumber & Box Company, has made a tentative application to the council for a franchise for an electric lighting system.

HEMET, CAL.—The city council has awarded the Southern Sierras Power Company contract for installing a new street lighting system, construction work to be started immediately.

UNION, ORE.—The city authorities have signed a five year contract with the Eastern Oregon Light & Power Company for a better street lighting system. The new plan calls for the immediate installing of larger lights and improved distribution.

BERKELEY, CAL.—The council has ordered electroliers for University avenue from Grove to Third street and on Bancroft way from College avenue to Piedmont avenue. Lights on College avenue from the university campus to the city line are being considered.

SEATTLE, WASH.—The city council has ordered the improvement of Madison street and others by the installation of a system of cluster lights along the curb line on each side, together with the installation of poles, conduits wires and other necessary apparatus, according to plans prepared by the city engineer.

LOS ANGELES, CAL.—The Board of Public Utilities has approved the agreement reached between householders of Herman and the Los Angeles Gas & Electric Corporation, whereby the corporation is to extend its gas mains at the first of the year on Walnut Hill avenue, Isleta street, Kendall avenue and Redfield avenue.

SAN FRANCISCO, CAL.—The supervisors' street lighting committee has come to a satisfactory understanding with Fourth street property owners regarding the lighting of that thoroughfare. Property owners are to furnish the electroliers and the city will furnish the current. There are to be four lights at corners where transfer points exist. Altogether there are to be 48 of these lights.

BRIGHAM CITY, UTAH.—The town of Mantua has been connected up with the Brigham City electric light plant and now enjoys the conveniences of a modern lighting system. The proposition has long been under consideration on the part of the people of Mantua and an election held last year authorized the town board to sell town bonds in the sum of $3000 with which to build a distributing system, having previously been assured that power could be purchased from Brigham City.

SALT LAKE CITY, UTAH.—If the city commission has its way in its present franchise negotiations with the Utah Light & Traction Company transfers will have to be issued to passengers on the street railway system at any time the passenger makes request for one while he is on the car. That the present rule of refusing transfers except at the time the fare is paid should be abolished, the commission agreed recently. Such a clause will go into the amended franchise being considered. The commission also decided to insert in the franchise a provision eliminating the minimum charge now prevailing for retail lighting current, believing that the consumer should pay for just the current used. The advisability of providing for an examination of the company's books once a year by experts engaged by the city to determine the reasonableness of rates also was discussed and may be included in the franchise. After the commission has completed a draft of the franchise the company will be asked to appear and present whatever objections it may have. It is considered certain that the company will protect some of the provisions, though it has already agreed to the rate reductions heretofore announced.

TRANSMISSION.

ALBUQUERQUE, N. M.—The third application for a power site made by Col. John Borrodaile of this city, representing the White Rock Canyon Hydroelectric Company, which plans to develop power in White Rock Canyon and transmit same to Santa Fe, Albuquerque and Las Vegas, has been approved by State Engineer James A. French. The company will decide on one of the three approved sites, and has six months in which to file plans for its proposed hydroelectric plant.

VANCOUVER, WASH.—J. H. Cunningham has filed notice with the county auditor of the appropriation of 500 cubic feet per second of the water of the east fork of the Lewis river. As stated in the notice filed, the water is to be used for hydraulic and electric power for municipal lighting, manufacturing and other commercial purposes. It is not known whether the development will take place immediately or not.

NORTH YAKIMA, WASH.—An ordinance has been passed granting to the Yakima Central Heating Company the franchise to maintain poles, wires and conduits for the transmission of electricity for lighting, heating and other purposes.

EUREKA, UTAH.—Some extensive improvements are being made here in Tintic by the Utah Power Company, between 40 and 50 men being employed on this work. In addition to the construction and equipment of a new substation, new lines are being erected to various parts of the Tintic district; and in Eureka an entirely new system of street lighting is being installed. There is considerable work connected with the installation of these new street lights it being necessary to put new cross-arms on many of the poles and to replace some of the older and lighter poles in various parts of the camp.

TRANSPORTATION.

BENICIA, CAL.—The A. D. Bowen Company has announced that work will soon be begun on the electric railroad from Benicia to Vallejo.

PLENTYWOOD, MONT.—Business men propose the question of the construction of an electric railroad from Plentywood to Raymond to connect with the Soo line.

OGDEN, UTAH.—Every preparation is being made by the Ogden, Logan & Idaho Railway Company for the extension of its electric line from Idlewild, the present Ogden canyon terminus, to Huntsville.

FRESNO, CAL.—The Fresno Interurban Railway Company has formulated a new plan for financing its proposed 26 miles of railroad, one branch of which will run from Fresno to the Centerville citrus district and the other from Fresno to the Clovis and Gould colony.

SAN FRANCISCO, CAL.—A resolution presented to the supervisors calling on the city engineer to report a plan whereby the congestion of street car traffic in the city may be relieved, with special consideration of the building of municipal car tracks on Market street from Eleventh to Kearny. The resolution has been referred to the committee on public utilities.

STOCKTON, CAL.—Negotiations are pending by which portions of the city lines of the Central California Traction Company will be abandoned and a universal transfer privilege established between the Traction line and the Stockton Electric Railway Company. It is understood that the Traction line out north San Joaquin street which parallels both the California and the El Dorado street car lines of the old company has never been a paying proposition and that this line will be abandoned on San Joaquin street and on Vine street between San Joaquin and El Dorado streets. Another portion of the Traction line to be abandoned according to the report is a strip on Park street and the terminus on Center street. The Tranction line will retain its interurban system and a strip of its Center street line, its Weber avenue line, its Pilgrim street service, and the strip on Vine street west of El Dorado and extending to Madison street.

TELEPHONE AND TELEGRAPH.

YERINGTON, NEV.—The Bell Telephone Company has been granted a franchise here.

TACOMA, WASH.—The new Auburn substation of the Pacific Coast Telephone & Telegraph Company was opened last week.

FERNDALE, WASH.—The Farmers' Mutual Telephone Company will start work at once on placing wires leading to new central station underground.

ALAMEDA, CAL.—The Pacific Telephone & Telegraph Company has applied for a 41-year franchise in this city. Sealed bids will be received by the council for such a franchise up to December 22d.

SAN FRANCISCO, CAL.—Bids closed December 1st for constructing frame telephone pay stations in Education, Horticulture, Food Products, California, Agriculture, Liberal Arts, Transportation, Varied Industries, Machinery Hall and Mines Buildings in the Expositon Grounds.

SEATTLE, WASH.—Telephone service has been established between the ships of the Pacific Coast Steamship Company in port here and the city lines. This is the first passenger line in the history of the harbor to have telephone connection with the city lines. The only other vessels similarly equipped here are the transport Dix and the cableship Burnside, which have telephone systems connecting with the quartermaster department when they are docked at Pier 11.